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ABSTRACT

Intended as a pilot version, this handbook deals with the consolidation of scientific and technical information, i.e., the purposeful structuring of texts or messages from existing public knowledge in order to affect the private knowledge of individuals who otherwise might not be able to effectively and efficiently access or use the public knowledge in its original form. Thirteen chapters are presented, covering: (1) the handbook's objectives and limitations, and the research methodology used in its compilation; (2) basic concepts and processes involved in information consolidation; (3) information consolidation in developing countries; (4) aspects of users to be studied before attempting consolidation of information, and user study methodologies; (5) the development of information consolidation products, with examples targeted to specific audiences; (6) the selection of items to be consolidated; (7) the evaluation of information and information sources; (8) evaluative analysis and synthesis of information, particularly as practised in information analysis centers; (9) the production of reviews and state of the art reports; (10) technical writing for non-technical audiences; (11) information packaging and repackaging; (12) information dissemination and marketing; and (13) the basic requirements of information consolidation presented in summary form. A sample list of information analysis centers and references for each chapter in the handbook are also provided. (Author/ESR)

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PGI/81/WS/16
Paris, July 1981

CONSOLIDATION OF INFORMATION

A Handbook on Evaluation, Restructuring and Repackaging of Scientific and Technical Information

(Pilot edition)

Prepared by
Tefko Saracevic &
Judith B. Wood

General Information Programme and UNISIST
of the
United Nations Educational, Scientific and Cultural Organization

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PREFACE

The present handbook has been prepared by Mr. Tefko Saracevic and Ms. Judith B. Wood, under a contract established in January 1980 between Unesco and the Mathew A. Baxter School of Information and Library Science of Case Western Reserve University (Cleveland, Ohio, U.S.A). It attempts to systematically present the various procedures involved in providing information services tailored to the needs of all potential information users including development planners, professionals, technicians and local workers, as well as others who participate in the development process. Although the study was originally intended to emphasize mainly techniques for the packaging and repackaging of information, the authors have found that the role of these techniques could not be effectively studied without due consideration of the information content which is needed by users; hence the problems of information evaluation, analysis and synthesis, as well as those of packaging and repackaging of information, have been extensively covered in this handbook on consolidation.

It is hoped that the present pilot version of the handbook can be reviewed and tested by persons who have responsibilities or interest in consolidating information and that it can be subsequently improved and disseminated to a wider audience of specialists, particularly in the developing countries. Suggestions for improvement of either the content or the presentation of the document are therefore very welcome. They should be addressed to :

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1. INTRODUCTION

1.1 AIMS

The general aim of this work is to contribute to the art of information handling by trying to provide a better understanding of concepts, processes, and options involved in specific information practices called information consolidation which are leading to a widening of the population of users served.

The objectives are:

1. To survey and synthesize a variety of ideas, methods, and processes related to consolidation of information and to present an international state-of-the-art on the topic.
2. To propose a set of standardized definitions of the concepts involved.
3. To discuss the role and importance of consolidation of information as one means for communicating scientific, technical, and related information to wide audience - particularly in relation to social and economic development.
4. To present requirements for setting up criteria, operations, and processes for consolidation of information.

The work is intended to serve as a handbook for use in discussions, decisions, and practices related to information consolidation - that is:

- as an aid in decision making on the available options for providing consolidated information;
- as a checklist for identifying requirements for setting up specific procedures for consolidation of information;
- as a text introducing and clarifying the concepts involved and as a standard for definitions.

1.2 ORIENTATION

The base for this work is the Final Report of the Symposium of Information Analysis and Consolidation (organized by UNESCO and held in Sri Lanka in 1978) (1-1). As such this Handbook is oriented particularly toward information specialists and persons concerned with information policy in developing countries to alert them to:

* possibilities and requirements for reaching more people through services involving information consolidation;
* needs for projects, studies, applications, refinements, and evaluations in this area.

The work is suitable particularly for information systems, analysis centers, and consolidation units dealing with scientific, technical, and related information (including information in social sciences, business, and commerce). The Handbook was commissioned by UNESCO in response to the ever more often expressed desire for information in the above subjects which may be evaluative in nature as well as appropriate for a much wider population of users than are served at present. In other words, even though the content of this work deals primarily with processes in consolidation of information, the main idea behind it is: How can scientific and technical information reach a wider population of users? Or even better: How can it reach the present nonusers?

1.3 METHOD

The method of preparing this Handbook consisted of: First, selecting, obtaining, and organizing information on the topic, and second, interpreting, analyzing, evaluating and synthesizing that information deemed most relevant to the objectives and orientation of the work. In other words, this work was in itself an exercise in one form of information consolidation.

The information was obtained in three ways: 1. literature searching, 2. personal solicitation, and 3. personal conversation.

1.3.1 LITERATURE SEARCHING

A wide variety of primary and secondary literature sources were searched to isolate relevant information. The search of primary literature involved:

* major world journals in information science and librarianship
* texts and articles from subjects other than information science, such as technical writing, technology transfer, appropriate technology, diffusion of innovations, international relations, transborder data flow, and the like
* reports and monographs from UNESCO and other UN agencies and results of search by UNESCO staff
* reports and monographs from a variety of nongovernmental international organizations such as the International Federation for Documentation (FID) and the International Council of Scientific Unions (ICSU)
* reports, monographs, and products of various information analysis centers which could be obtained from various parts of the world
* citations from relevant articles, reports, and monographs.

Secondary information sources were searched by computer and manually to identify possible relevant primary sources. The search of secondary sources involved the following files or printed indexes: ERIC, NTIS, LISA, COMPENDEX, INSPEC, ISMEC, Science Citation Index, Social Science Citation Index, PATS, Information Science Abstracts, Referationyj Zhurnal's English section on Informatics, and catalogs of UN publications.

The result was close to a thousand citations which served as a pool for selection of the most relevant items as listed in the bibliography. Unfortunately, most of the items found in the literature were not very useful for what was attempted in this Handbook, e.g. a lot of literature was repetitive in saying in one way or another that information consolidation is needed but not giving any other details, practical suggestions, or examples.

Overall, the literature on information analysis and synthesis (as a process or function) and on information analysis centers (as organizational units) in general, and on information consolidation in particular, is not so much technical as philosophical, not so much methodological as conceptual.

1.3.2 PERSONAL SOLICITATION

This was done through a letter sent by the authors to about 500 individuals (identified from mailing lists of professional societies, personal communications, and through authorship of articles in the literature). The letter was also sent by the General Information Program (PGI) of UNESCO to their contacts in member countries. The letter asked for information on any systems and practices of information consolidation as well as examples of products or services. The response was much less than hoped for, with only about two dozen answers received. However, those responses were very helpful.

1.3.3 PERSONAL CONVERSATION

Opinions, experiences, and suggestions were solicited from a large number of colleagues met by the authors at local, national, and international meetings and through long distance telephone calls. Particularly helpful were suggestions and feedback from the staff of PGI, who in turn conversed on the topic with their professional contacts in many countries. No visits to information systems dealing with information consolidation were scheduled within the realm of this project. However, the authors' experiences from previous works, contacts, and visits were, of course, heavily utilized.

1.3.4 APPROACH

The information obtained was organized into a number of logically connected sets very much influenced by the mentioned UNESCO symposium on Information Analysis and Consolidation. This resulted in an outline of the Handbook, first in a rough and general form and then in more and more detail. Next, the criteria for presentation of the content were specified and the content fitted accordingly into the outline. Finally, the product was circulated to a number of colleagues and the staff of PGI for comments. This version of the Handbook may be considered as a first edition in need of considerable testing and feedback.

1.4 LIMITATIONS

There are a number of serious objective limitations imposed on this work, all stemming from the limitations of the subject area itself.

First, the subject is small. In comparison to information representation (e.g. indexing, abstracting, classifying, cataloging), information consolidation in any form or shape is practiced by far fewer information systems. Information representation is widely practiced, but information consolidation is not. As a result, there is not much to draw from.

Second, the concepts involved in information consolidation are not well defined -- if defined at all. The terminology is chaotic, making it hard even to talk or communicate about the subject.

Third, the literature on the subject is very small, fragmented, and hard to obtain. As mentioned, the efforts that deal with information consolidation are not many, and even fewer of these are described in open literature. People who did things, didn't write about them, and if they did it was generally in the fugitive report literature. As a result, a synthesis of this area has to depend more on reconstruction than on literature review.

There are also subjective limitations. A relatively short time and small resources were available for the project (2 person/months). In addition, although many literature and personal sources were consulted and much advice sought (and gladly received), still in the end, it was the best judgement of the authors alone that was responsible for the final organization and content of this Handbook.

1.5 ORGANIZATION OF THE HANDBOOK

The Handbook is organized in thirteen chapters:

1. Introduction: the objectives of the Handbook, the methods used in its compilation,and the limitations of the work.
2. Definitions and Conceptual Framework: the definitions of basic concepts involved, culminating in enumeration of processes involved in information consolidation and in discussion of its value.
3. Framework within Social and Economic Development: the role and place of information consolidation within the frame of the most often perceived information problems in developing countries.
4. Users and User Studies: variables and aspects of users to be studied as a prelude to efforts in information consolidation; summary of the most frequently used methods.
5. From User Studies to Products: development of information consolidation products and examples of products targeted to specific audiences.
6. Selection: the elements involved in selection of items to be consolidated, i.e. selection policy, aids and methods.
7. Evaluation: the criteria methods and problems used in evaluation of information and information sources to be consolidated and analyzed.
8. Information Analysis and Synthesis: the concept of evaluative analysis and synthesis; information analysis centers; major approaches and methods used; and a sample of existing information analysis centers involved in information consolidation.
9. Reviews and State-of-the-Arts Reports: description of these end-products as one type of information consolidation; methods used and problems encountered.

10. Technical Writing and Scaling to Audience: the requirements and techniques for processes of writing and rewriting of information for a wide audience not familiar with technical language, jargon, and style -- as another type of information consolidation.

11. Packaging and Repackaging of Information: an overview of forms in which information is presented to increase its acceptance by a wide audience.

12. Dissemination and Marketing of Information: the basic principles of information dissemination and marketing aimed at increasing the utilization of information.

13. Requirements for Information Consolidation: summary of the suggestions of previous sections; a checklist of aspects which need to be considered in instituting and conducting any information consolidation effort, particuarly stressing the human and economic requirements.

The references from which the ideas and concepts in this Handbook were synthesized, are listed for each chapter separately. Even though we have not referred directly in the text to every single reference listed, we used all of them and we fully and gratefully acknowledge the contribution of every one of them to this work.

A great number of definitions are provided. *THE TERMS AND CONCEPTS SUBSEQUENTLY DEFINED ARE CAPATALIZED.*

2. DEFINITIONS AND CONCEPTUAL FRAMEWORK

2.1 OVERVIEW

All of the activities that deal with information throughout the world are in a state of rapid and great change. This involves: influx of new ideas from a number of disciplines; expansion of applications; deployment of new systems, techniques and technology; expansion of new theoretical, experimental, and even philosophical grounds; and so forth.

Many fields of human scientific, technical, commercial, social, and cultural endeavors have increasingly become concerned and involved with information, particularly with efforts that deal with controlling the so called "information explosion" and with dissemination of information to a wider audience in countries at all stages of development.

It is not surprising then that the terminology and concepts dealing with information work in general, and consolidation of information in particular, are in a state of flux, if not outright chaos. The same thing is often denoted (labeled) by different names, and conversely, different things are given the same name. As yet there is no consensus for common names for many new concepts. On the other hand, a number of concepts talked about are often given different connotations (sum of meanings, implications). This can be found not only among different works in time and place, but even within the same work. Obviously, this makes for great difficulties in communication and thus even acts as a barrier to progress. It is no consolation that a similar situation exists in other (even older) fields where multidisciplinary and problem oriented approaches are the order of the day.

For these reasons we have found an implicit need to devote a whole chapter of this Handbook to definitions and to clarification of concepts involved. Besides, a clear terminology, consistently applied and mutually understood in the same way by both senders and recipients is a fundamental prerequisite for the effectiveness of any and all efforts in consolidation of information.

2.2 INFORMATION: THE BASIC PHENOMENON

Underlying consolidation of information are the phenomenon of information and the process of communication. But what is information? Information is a phenomenon as basic as energy and matter. All living systems, from the lowest to the highest, from a cell, to an organ, to an organism, to a group, to an organization, to a society, to a supranational system, are distinguished by processing matter-energy on one hand and information on the other hand (2-2). Information is needed for patterning of matter-energy.

Being such basic phenomena, a number of working definitions of information are possible. These are not necessarily contradictory at all, but supplementary-they are derived from looking at information from different levels and angles.

In this sense we shall provide four working definitions of information that are most applicable to the concept of information consolidation. Each is derived from a somewhat different point of view and having in mind a different property (characteristic) or effect of information. But each illuminates an important aspect to be considered. Here is the first working definition:

> 1. *INFORMATION is a selection from a set of available messages, a selection which reduces uncertainty. Information is that which relieves uncertainty.*

This definition, extracted from Shannon's information theory (2-3) treats information as an invariant property of something else - a message, a signal, or document. In a very basic and universal sense information is here considered as the degrees of freedom that exist in a given situation to choose among signals, symbols, messages or patterns to be transmitted. Such a probabilistic viewpoint allowed for development of a bit, a particular (and restrictive) numerical measure of the amount of information.

2. *INFORMATION is the meaning that a human assigns to data by means of the known conventions used in their representation.*

This definition is accepted by the American National Standards Institute in connection with efforts to streamline data processing and computer terminology. The stress here is on human interpretation and the representation of data. This definition illuminates very well the critical role which the conventions for representation, mutually accepted rules, linguistic aspects, etc. play in relation to information. The definition involves or adds the concept of meaning, where in a somewhat circuitous way we may define *MEANING is the significance of information to a system which processes it;* it constitutes a change in that system's processes elicited by the information, often resulting from associations made to it on previous experiences with it.

3. *INFORMATION is the structure of any text which is capable of changing the image-structure of a recipient. (TEXT is a collection of signs purposefully structured by a sender with the intention of changing the image-structure of a recipient).*

This (somewhat cumbersome) definition, proposed for use in information science (2-), is even more closely aligned with what is attempted by information consolidation. In this view, the concern is with changes (additions, deletions, confirmation, reorganization) of a person's state of knowing and being ("image"). One's image is at least in part structured by what one receives in the form of messages from others. When a receptive individual is exposed to and accepts a message from the external environment he has the potential for an "in-formation", an inner forming, changing, or alteration. Texts which may be purposefully structured to affect in a positive way the image-structure or knowledge of recipients are of particular concern to information science and to information transfer as promoted by UNISIST in particular.

4. INFORMATION *is data of value in decision making.*

This misleadingly simple definition taken from decision theory (2-4) is also closely aligned to what is attempted by consolidation of information. Here information is linked to a value (be it esthetic, moral, ethical, economic , or societal values)and to human decisions of whatever kind. The notion of potential value of information in human affairs is basic to justification of any and all information activities. However, implied in this definition is a most important distinction: information by itself has no inherent value. It has value only when used in some decision process whether personal, institutional, national, or international in scope. Information conserves other resources through better or improved decisions. Use of information, not information itself is what makes it valuable for individuals and society. It doesn't matter how much information is available at the fingertips of an individual or a society - if it is not used, it is useless. Thinking about information in this way clearly has a great potential to affect the nature of information activities.

Finally, let us provide one more useful definition: that of public knowledge (2-5). The concept of knowledge is used closely with information, at times even interchangeably. It is very hard, if not impossible, to specify in any detail the relation or differences between information and knowledge. In philosophy, knowledge is accepted as a psychological state which can be neither fully defined nor measured. But for our purposes of working definitions, a useful distinction is often made between private and public knowledge. Private knowledge is analogous to the image-structure of an individual as viewed in the third definition of information. In turn,

> PUBLIC KNOWLEDGE *is a rational consensus of ideas and information.*

Throughout the history of human affairs public knowledge has been changing constantly. The rate of change may have varied from subject to subject and time to time but the change was and still is a constant. Public knowledge will inevitably continue to change and grow in size and complexity. Thus the need for continuous efforts to effectively and efficiently transmit these changes.

From these definitions we can identify the basic aspects and definitions of consolidated information.

2.3 CONSOLIDATED INFORMATION

As can be seen a number of working definitions of information can be provided. So can a number of working definitions of consolidated information. Three of them are given here. But to stress again: these are not contradictory, but complementary, explaining different aspects.

The aforementioned UNESCO Symposium on Information Analysis and Consolidation (1-1) was among others very much concerned with definitions and distinctions particularly of the terms "analysis," and "information consolidation unit" in relation to their particular function. It was observed that "analysis" comprised a wide range of functions, such as abstracting, indexing, translation, reviewing, consolidation, etc. However, a number of analysis centers do not always perform the consolidation function. It was also pointed out that information consolidation activities can be performed within institutions or systems other than information analysis centers, even by individuals or group of individuals. It was therefore decided that the term "information consolidation activities" should be used as follows:

> INFORMATION CONSOLIDATION ACTIVITIES *is used to define the responsibility exercised by individuals, departments or organizations for evaluating and compressing relevant documents in order to provide definite user groups with reliable and concise new bodies of knowledge.*
> *Individuals or groups of individuals performing information consolidation activities would each constitute an* INFORMATION CONSOLIDATION UNIT (ICU).

It was emphasized that the most important consolidation function was evaluation, i.e. the retaining of reliable information only. The outputs of information consolidation activities are reliable and concise products carrying usually an added value. Within a group of peers and management consolidated information may be provided without being restructured or repackaged, but it is usually restructured or repackaged for entrepreneurs and other users. The evaluative function is what distinguishes information consolidation from processes such as indexing, summarizing, and abstracting. Integrating these concerns and definitions with those previously given for "information" we may now provide a more comprehensive definition of consolidated information:

> *CONSOLIDATED INFORMATION is public knowledge specifically selected, analyzed, evaluated, and possibly restructured and repackaged for the purpose of serving some of the immediate decisions, problems, and information needs of a defined clientele or social group, who otherwise may not be able to effectively and efficiently access and use this knowledge as available in the great amounts of documents or in its original form. The criteria for selection, evaluation, restructuring, and repackaging of this knowledge are derived from the potential clientele.*

In a little more concise and generalized way we may also take this view:

> *CONSOLIDATED INFORMATION is a text(s) or message(s) purposefully structured from existing public knowledge*

> *to affect the private knowledge and decisions of individuals who otherwise may not be able to effectively and efficiently access or use this public knowledge from the original amounts or in the original structure and form.*

Consolidated information is then a particular form of representation of information where all the general aspects of information (as defined above) are still fully valid but where specific constraints are imposed; namely:

* it is a set of messages which has a probability/potential of reducing uncertainty, but with the particular constraint that the message(s) must be selected, evaluated, and structured on the basis of the needs of potential recipients;
* it has meaning assigned to data by conventions used in their representation, conventions which are known by both senders and recipients, and which are particularly selected from the point of view of recipients;
* it is a structured text which has a potential for affecting the knowledge of recipients, where the structure of the text is constructed primarily on the basis of the needs of the recipients;
* it has a potential of being of value in decision making, where the problems and processes of decision makers are paramount in its selection, evaluation, and structure.

Figure 2-1 presents the relation between public knowledge and users, having in between primary and secondary information sources and consolidated information. As can be seen not all primary or secondary sources may reach the users or be appropriate for users. The role of consolidated information is to be as

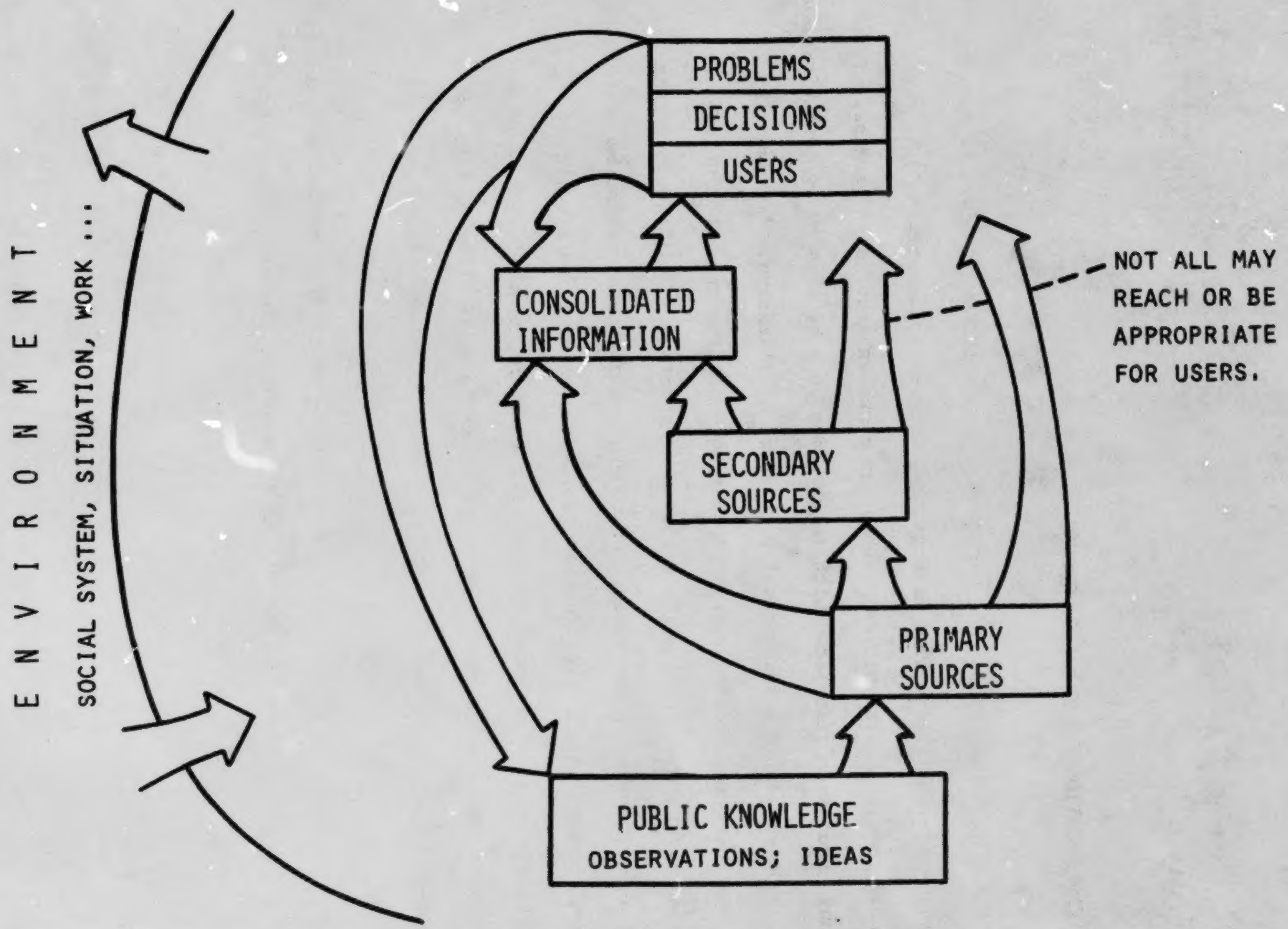

FIGURE 2-1: RELATION BETWEEN PUBLIC KNOWLEDGE, CONSOLIDATED INFORMATION AND USERS

appropriate for users as possible.

2.4 COMMUNICATION: THE BASIC PROCESS

A PROCESS is a sequence of events with some results. Phenomena such as energy, matter, or information undergo many processes; sometimes it is even difficult to distinguish between a phenomenon and an associated process. There are many processes associated with information, one of them being communication.

Communication is a fundamental process of civilization. In its original Latin meaning communication refers to sharing - particularly sharing of knowledge among human beings. This notion of sharing is still basic to the modern understanding of the concept of communication, even though the use of the term "communication" proliferated into many contexts, some quite inappropriate to this original notion. For instance, transmission of signals or documents (which sometimes is referred to as "communication"), although a prerequisite is not at all the same as communication of information.

> *COMMUNICATION is a process by which information is conveyed among the members of a population through a common system of symbols.*

In a more detailed sense:

> *COMMUNICATION is a process whereby information is transferred through a given channel (or channels) from a source or sender to a destination or recipient. The process can be*

> *in both directions involving feedback from the recipients; it my also have an ability for self-adjustment. It is usually carried out in a number of stages. There may also be a noise source, i.e. source of unwanted information.*

This definition, shown graphically in Figure 2-2 although an oversimplification, represents the most widely accepted model of communication today, even though it traces the origin of its basic form directly to Aristotle. Together with problems enunciated below, it defines the essential elements involved in all kinds of communication processes.

There are many problems encountered in communication. Warren Weaver (2-3) has pointed to three levels of communication problems:

1. TECHNICAL PROBLEMS: *dealing with the accuracy with which symbols of communication are transmitted (were the symbols received as sent?*
2. SEMANTIC PROBLEMS: *dealing with the precision with which the transmitted symbols preserve the meaning of conveyed information (was the meaning understood in the same way by both sender and recipient?)*
3. RELEVANCE OR EFFECTIVENESS PROBLEMS: *dealing with effectiveness with which the received information affects the recipient's conduct in a desired way; achieving a result desired by either the source, the destination, or both. (Was the desired effect or purpose achieved? Was the information indeed transferred?*

The technical problem deals with the fairly straightforward process of signal transmission (including for instance, the way something is printed or layed-out) while the other two deal with much more ambiguous notions of meaning and relevance respectively. However, the three levels of problems are not

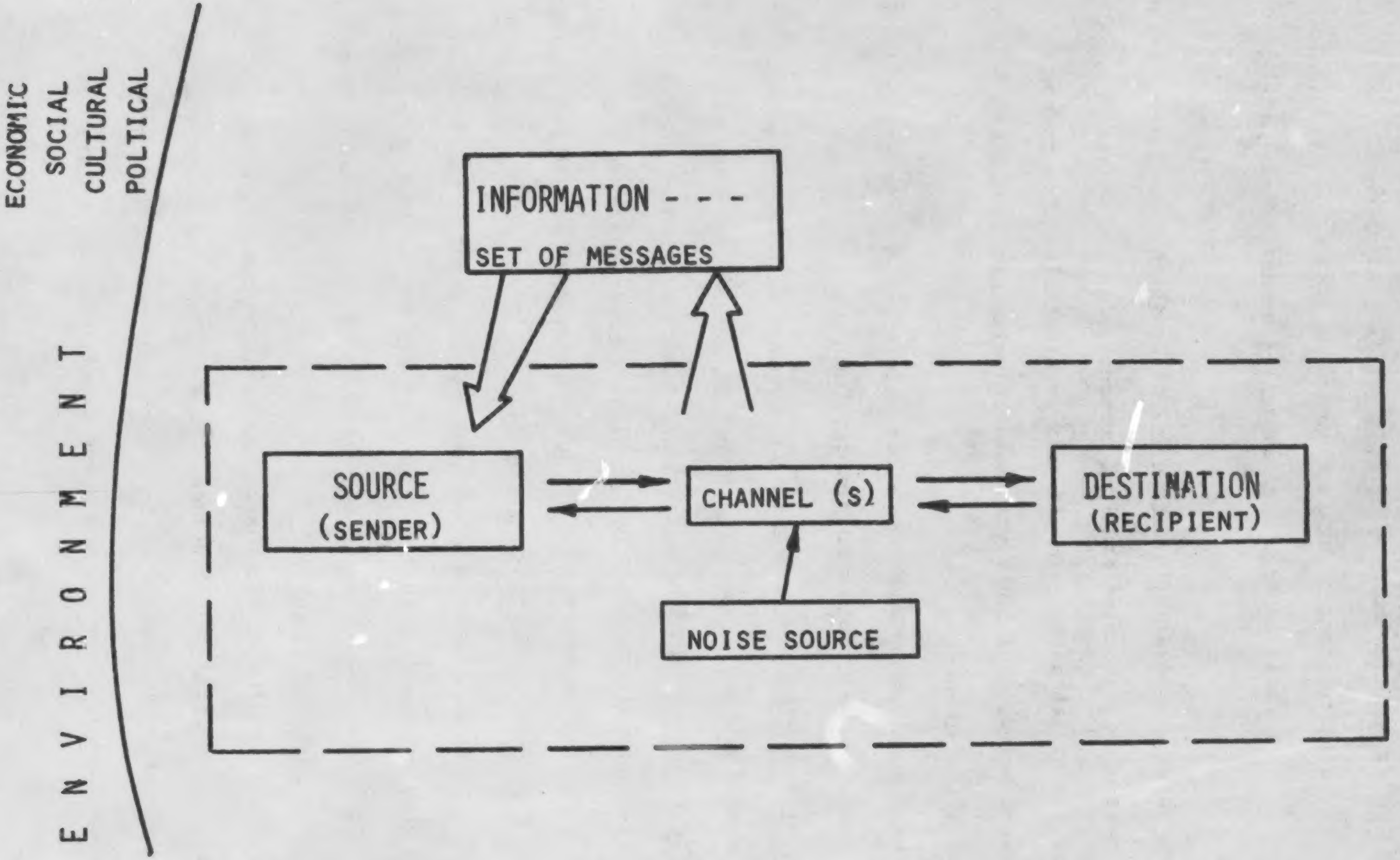

FIGURE 2-2: ELEMENTS IN A COMMUNICATION PROCESS

independent; while dealing with the semantic problems one has to be concerned with technical problems, and while dealing with effectiveness problems one has to be concerned with the other two. All communication problems are complex, but the complexity increases greatly as one proceeds to deal with technical and then with semantic and then with effectiveness problems.

Furthermore, no communication is carried out in a vacuum. The environmental (social, cultural, political, economic, etc.) factors greatly affect any and all aspects and problem levels of communication. And often the consequences or impact of communication is assessed not only in terms of recipients (or even senders), but in terms of the environmental factors.

Different systems and types of communication processes are instituted to deal with specific communication problems. Information consolidation is one of the attempts to deal with the effectiveness problem of communication and thus with the other two levels of problems as well. However, the concentration is from the recipients point of view. As such it is a process of great complexity and considerable cost. It is an art rather than a science. And, it is a high art at that.

2.4.1 DIFFUSION

There are, of course, many specific types of communication processes, instituted for specific purposes, audiences, times, circumstances. . . such as mass communication, scientific and technical communication, interpersonal communication, teaching, propaganda, advertising, etc. Diffusion is a specific type of communication of special interest in the context of consolidated information.

> *DIFFUSION is a communication process by which a new idea [illegible] an innovation spreads among the members of a social system (or among a defined social group).*

In diffusion the absolute newness of an idea or innovation is not important, but its relative newness to a social group is. It doesn't matter if an idea was known or innovation was used for a long time (or a period of time) elsewhere, what matters is that it is new to a given social system or a social group of individuals. In connection with this also of importance is to consider (i) the time lags in diffusion and the rate of adoption and (ii) the consequences which occur as a result of the adoption or rejection of an idea or innovation. (The concepts related to diffusion are further elaborated in Chapter 4 on Users and User Studies).

To underscore: diffusion has to be understood as a communication process in which all components - particularly users and their situation (or social system) - deserve comparable and undislocated attention. For instance, the manner and rate with which technology is adopted cannot be studied and interpreted independently from the social and economic system where that technology is induced.

One of the obvious principles of human communication is that the transfer of ideas occurs most frequently between a source and a receiver who are alike, similar, homophilous. *HOMOPHILY (from the Greek, meaning alike or equal) is the degree to which pairs of individuals who interact are similar in certain attributes, such as language, beliefs, values, education, social status, and the like. HETEROPHILY is the mirror opposite: the degree to which pairs of individuals who interact are different in certain attributes.* More effective communication occurs when source and receiver are homophilous. However, one of the most difficult problems in the communication of innovations and new ideas is that the source is usually quite heterophilous to the receiver. On the one hand, they simply do not talk the same language, but on the other hand, the very nature of diffusion demands that at least some degree of heterophily be present between source and receiver.

This heterophily gap in diffusion is much wider when source and receiver do not have a common culture, as is the case upon transfer of technological innovation from more to less developed countries as discussed in the next chapter.

Information consolidation is about diffusion, about bridging the heterophily gap. It is an attempt to enhance communication of new ideas and innovations by making the messages evaluative and more appropriate to users and to make this communication more effective, easier, faster, and the consequences more as desired.

The communication model presented previously in Figure 2-2 can be easily utilized to describe the specific elements involved in diffusion of information as shown in Figure 2-3 and as described in Chapter 4 and seen in Figure 4-3.

2.5 INFORMATION SYSTEMS: THE GENERIC STRUCTURE

Information consolidation is carried out by a given type of information system or by an information consolidation unit, which in itself is a system. Hence it is of importance to examine information systems in general.

> *A SYSTEM is a set of elements in interaction, and a MAN MADE SYSTEM is an integrated assembly of components that*

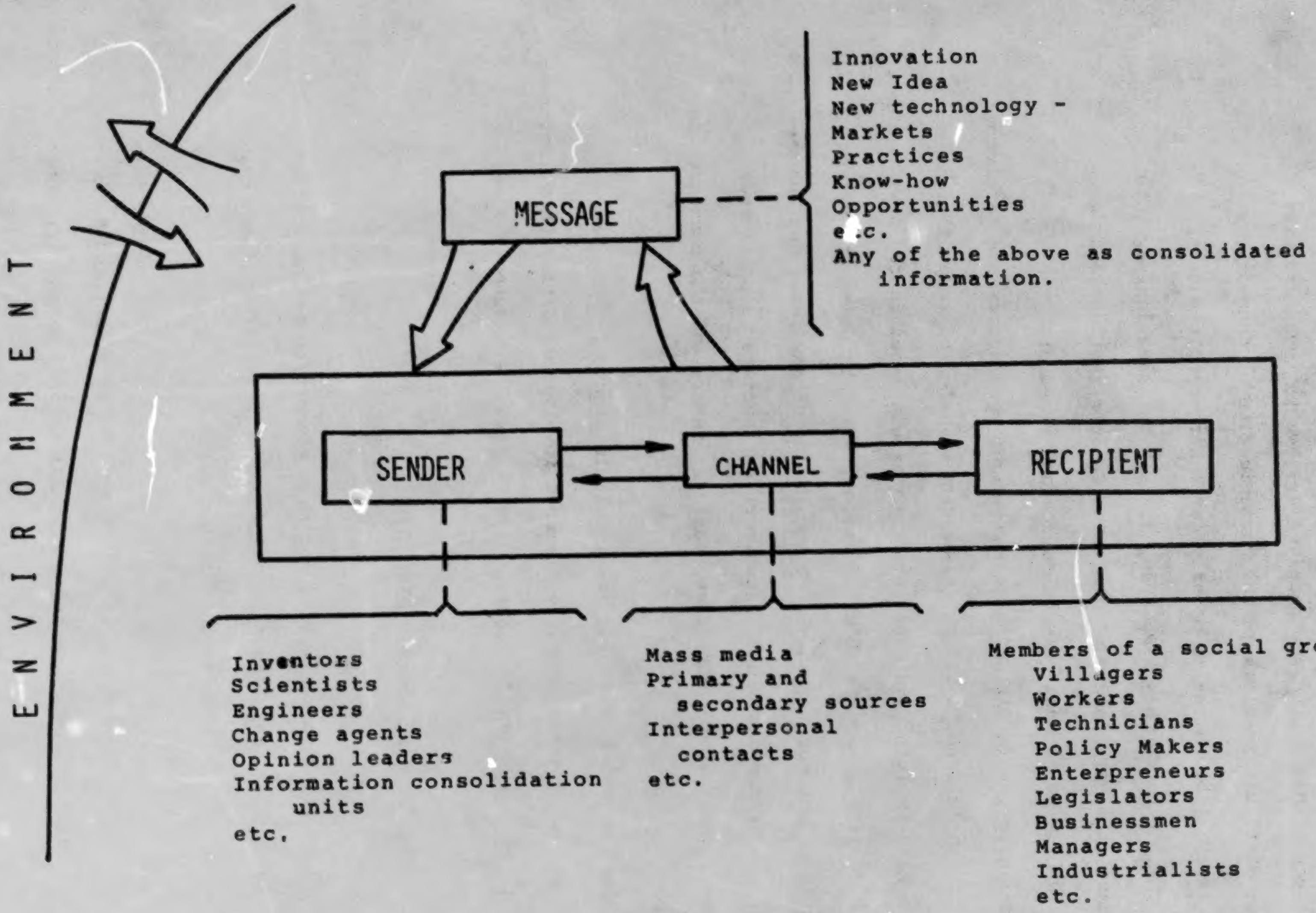

FIGURE 2-3 ELEMENTS IN DIFFUSION OF INNOVATION / OR IDEAS IN THE FRAMEWORK OF A COMMUNICATION PROCESS

> *interact to perform predetermined functions (processes) for given objectives (purposes).*

Thus for any design, operation, evaluation, or optimization of a system, it is essential to specify both: (i) its objectives and (ii) the functions (processes) that interact to make certain inputs and provide certain outputs in the achievement of these purposes. A performance can be specified, evaluated, and optimized only in terms of the inputs to and outputs from a system as they are related to its objectives. Without a clear statement and understanding of its purposes, a system, if operating at all, operates at random and in a vacuum.

Systems are instituted to carry out processes. As mentioned, there are a variety of types of communication and thus a variety of communication systems (i.e. systems that carry out communication processes).

> *INFORMATION SYSTEMS are a type of communication systems which select, organize, store, and disseminate public knowledge for the purpose of communication of that knowledge to users.*

In other words, the

> *PURPOSE OF INFORMATION SYSTEMS is recovery and communication of relevant public knowledge to users, where*
> *RELEVANCE is the measure of the effectiveness of a contact between a source and a destination in a communication process.*

There are many types of information systems - e.g. libraries, information retrieval systems, information analysis centers, question answering systems, airline reservation systems, market information systems, technical writing centers, and so forth. Each of these has to deal with semantic problems of information and to varying degrees may deal with the effectiveness problem as well. Information consolidation may be a part of any of these systems; however, some information systems have consolidation of information as one of their prime or even exclusive orientations. For instance, many (but not all) information analysis centers are dealing with information consolidation exclusively or as one of their products. On the other hand, there are also individuals or units performing information consolidation within some larger system or organization which is not engaged in information processing, such as a technical writing center in an industry. As yet no widely accepted name exists to cover systems or units with such activities; the closest to a standardized term is the term already mentioned, i.e."information consolidation unit"(ICU) proposed by UNESCO. It should be realized that every one of the ICU's, be it in an information analysis center or in a non-information organization still has all of the information systems' properties enumerated here.

Every information system, including those that deal with consolidation of information (i.e. ICU's) has at minimum the following objectives:

To provide for information needs

* of a given group of users
* in relation to their given problems
* with information from given subject(s)
* contained in given information sources

*under given economic and other *constraints and requirements*.

Therefore, to specify objectives all information systems (particularly those dealing with information consolidation) have to study and specify the aspects underlined above in great detail.

Here are the *minimum functions or processes* of every information system:

1. *Selection* and *acquisition* of information sources
2. *Representation* or *restructuring* of information
3. *Organization*, *storage*, and/or making of information *products*
4. *Retrieval* (question analysis, searching)
5. *Dissemination* and provision of information services

Depending on their purpose, various information systems (including ICU's) may stress more or less any of these functions and have additional functions, but an absence of concern for any of these basic functions in a given information system makes for an incomplete and thus ineffective information system. However, due to recent developments of information networks, performance of some of the functions may be shared among systems or even completely taken over from other information systems, e.g. as is the case of computer searching of data bases represented, constructed, and organized by some other system.

2.6 PROCESSES IN INFORMATION CONSOLIDATION

Already implied in the definitions given so far are these basic processes associated with consolidation of information:

1. *Study of potential users* to derive criteria for all the other processes
2. *Selection of information source(s)* potentially containing the most

useful information for given user problems and information needs; the selection can be done from a variety of primary and secondary sources

3. Evaluation of information as to its intrinsic merit, validity, and reliability
4. Analysis to identify and extract the most salient features
5. Restructuring (if necessary) of the extracted information into a content that can be used most effectively and efficiently by users; this may involve synthesis, condensation, rewriting, simplifying, review, state-of-the-art presentation, etc.
6. Packaging and/or repackaging of restructured information in a form that will enhance the potential of its use. (Restructuring deals with contents or substance of information while packaging deals with the form of its presentation.)
7. Diffusion or dissemination of information in ways that will encourage and promote its use; this may also involves education of users in the use of information and marketing of information
8. Feedback from users, evaluation of the efforts, and adjustments.

These processes will be dealt with at some length in other sections of the *Handbook*. Here are some working definitions:

> *SELECTION (of information sources) is a process of choosing the potentially most relevant information sources from a larger pool of available sources for further processing by an information system and of rejecting the other sources, on the basis of predetermined criteria, principles, and policies. It is a decision whether the information sources*

are of utility and meet the needs of users. From a different point of view, selection may also be viewed as an elimination of information sources that are less useful in order to make those that are more useful manageable.

EVALUATION is a process of ascertaining and appraising the intrinsic merit, validity and reliability of the information conveyed, comparison of information on the same topic from a variety of sources and if possible a resolution or reconciliation of conflicting information.

ANALYSIS (of information) is a process of determining and isolating the most salient information conveyed by an information source and separating this information in its constituent elements on the basis of predetermined evaluation and other criteria.

MERGING (of information) is a process of combining the most salient information as analyzed from a number of information sources.

RESTRUCTURING (of information) is a generic name for processes dealing with presenting the analyzed information as a new whole which differs from the original presentation(s) or arrangement(s). Among others these processes include:

CONDENSATION - derivation of a short summary of information from a source or extraction of key statements (sentences, paragraphs, figures, etc.)

SYNTHESIS - condensation and distillation of analyzed information from one or more sources and presentation of *information in a new arrangement or structure with an interpretative or evaluative point of view.*

REVIEW - *a synthesis and critical examination of retrospective information on a topic accounted for in its broader framework.*

STATE-OF-THE-ART - *a review concentrating on the most up to date information on a topic.*

SIMPLIFYING (REWRITING) - *expressing information which was originally in a technical language not understood by an audience, in the language of the audience.*

PACKAGING *of information is a physical presentation of information in a given form.*

REPACKAGING *of information is a rearrangement of physical forms in which information is presented or physical presentation in a given form of restructured information, tailored to the requirements of a specific clientele.*

Figure 2-4 summarizes the processes and elements involved. Information consolidation is quite evidently a complex proposition with many aspects to consider and many processes and elements to be linked. As in many other complex situations, information consolidation will be as strong as its weakest link. For information consolidation to be effective as a whole, all of the processes enumerated have to be strong.

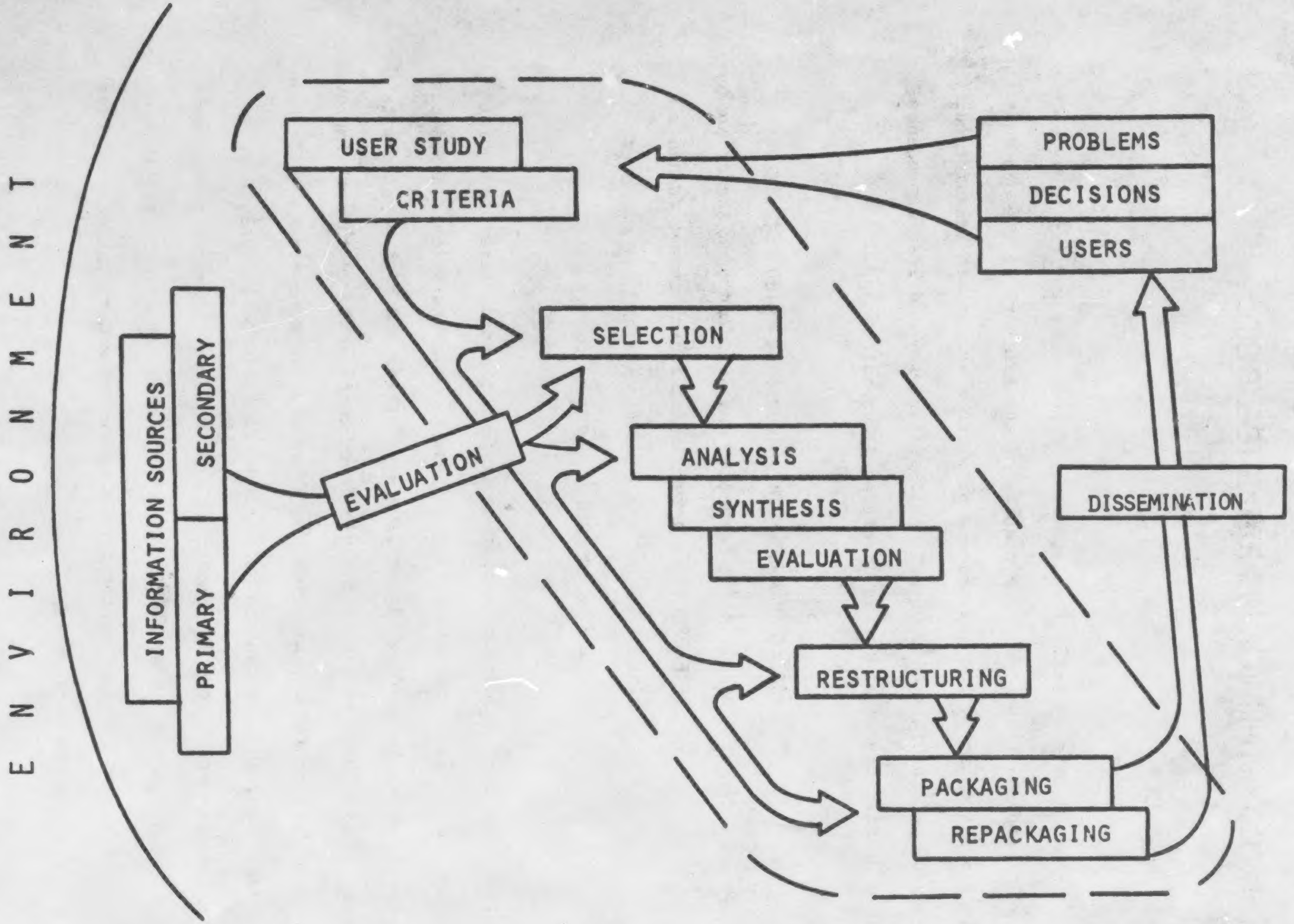

FIGURE 2-4: PROCESSES IN INFORMATION CONSOLIDATION

3. FRAMEWORK WITHIN SOCIAL AND ECONOMIC DEVELOPMENT

3.1 OVERVIEW

What is development? The term has, of course, a variety of meanings depending on context. The meaning of concern here is the one that describes the highly complex process by which a society is transformed, changed, to exhibit traits of more self-sufficiency and less dependence, and a greater degree of (or an accelerated) social change.

> *SOCIAL CHANGE is the process by which alterations occur in the structure and function of a social system. DEVELOPMENT is a purposeful social change toward a kind of social and economic system that a society decided it wanted.*

In other words, development is change; it is a planned, directed social change. It is an introduction of new ideas and configurations in a social system in order to produce higher levels of living and higher per capita income coupled with equitable distribution, to be achieved through improved and more just social organization and behavior, and more modern production methods. Many changes can and do occur at an individual level, e.g. a person adopts or rejects an innovation or new idea. However, development (as defined today by governments and international organizations) is a change that occurs at a level of society; development is modernization at a level of a social system as a whole.

Many factors are involved in and do affect social change, for better or worse. Communication is one of them. In fact, communication is essential for social change. In this way consolidated information is related to development.

But is consolidation of information a slogan in search of a substance or does it have substance as a solution to serious contemporary information problems particularly in relation to development? In order to answer this question beyond some simple positive or negative statement we need to analyze the contemporary information problems as they affect the developing world. The problems are myriad, complex, and interdependent. Thus even a categorization of these problems is a problem. However, it is important to attempt such a categorization in order to provide a general framework for viewing of efforts dealing with information consolidation and furthermore in order to place information consolidation within the spectrum of other information activities.

If we accept that the basic aim of any and all information activities is for information to be utilized, then we have to consider that the minimum conditions for effective transfer and use of information for socioeconomic development include:

1. a propensity on the part of the decision makers and problem solvers to use information, which is based among other things, on recognition of the value of and need for information.
2. A level of infrastructure (indigenous information systems and services) that makes the right information first available and then accessible for use.

3. A type of political and social conditions which are favorable for encouraging the use of information and development of an information infrastructure.

In contrast to industrial countries, developing countries meet these conditions only partially and to highly variable degrees. Thus the problems are categorized here, and the framework is organized along these aspects:

1. Recognition of the value and role of information in the process of socio-economic development.
2. Availability of information, particularly the definition of the kinds of information needed for development.
3. Accessibility of information, particularly the intellectual organization/representation of information.
4. Utilization of information and the requirements for increase in utilization.

This framework is a synthesis from a number of analyses of contemporary information problems in both the developed and developing world as listed in references for this chapter. However, no discussion was found of an overall framework for consolidated information. Thus this is a first attempt at such a framework.

3.2 RECOGNITION

What resources are needed for development? The recognition of the array of elements or resources which are important in development keeps changing and broadening; it is still an evolutionary process. About three decades ago when development became a primary concern of international cooperation and a national priority of a great many countries, the heavy emphasis was on economic aspects and resources. About two decades ago it was recognized that money alone, although necessary, is not quite sufficient and the emphasis broadened to include a great concern with physical and technical elements. About a decade ago concerns with human resources came into focus (without, of course, discarding the concerns with other elements). Development is now seen as an organic process involving a number of interacting elements. Clearly, a recognition of the importance or value of a given element in development is a prerequisite for the moral, political, and material support afforded to that element. The degree and sincerity of recognition is reflected in the priority for and degree of support.

The importance of recognition of an element in development was recently reflected in the Nobel Prize in economics awarded in 1980 to Theodore Schultz. He assessed the role of agriculture, education, and human factors in development and argued that failure to stress these in development is charting a course toward deep disappointment. The clear analysis that he presented on the relation between these factors and development was deemed worth a Nobel Prize.

The latest element that has entered this process of recognition is information, particularly scientific, technical, commercial, and related information. It is slowly being recognized that the organic process of development involves -- in addition to the economic, technical, physical and human factors, -- information as well. Unfortunately, such recognition of information in developing countries is not very widespread. In fact, the low level or even lack of recognition of the potential role and value of information, particularly among problem solvers and officials of higher rank in developing countries, is probably the one factor presenting the greatest internal and external obstacles to the beneficial use of information in development. This problem is still critical, despite many efforts to alleviate it by the UN family of agencies and by other international and national organizations.

Why is this so? What conditions exist in developing countries that work against such wide recognition? Here are the most often listed reasons:

- * In many countries the propensity to use of knowledge is not widespread and the motivation to use information for improvement is low.
- * The problem solvers tend to rely on their experience for decisions rather than to seek out information -- thus they do not have a real feeling for the value of information.
- * The problem solvers are not adept at mapping raw information into specific problems (e.g. synthesizing, interpreting, and adapting information from various sources).
- * In many developing countries, the education systems, particularly universities, are not supportive of information seeking behavior.
- * And then, the right information in the right amount, language, and form may not be available at the right time even when there is willingness and desire to use information; the information available may itself often be inappropriate to the problems at hand or not be understandable, or there may be too much of it -- leading to a disregard for the value of information in general.

- The status and salaries of information specialists and librarians are low in comparison to other professions; thus their services are treated accordingly. This creates a vicious circle: because of low status and salaries in the profession qualified manpower is hard to attract.

These problems are and have to be attacked in many ways, from general and continuing education to specialized information services. Information consolidation is one of the ways. Information consolidation can play a significant role in the battle for wider recognition of the value of information for development, because it is an attempt to provide appropriate information. When a person receives information that is appropriate to the task at hand and structured and packaged to coincide with his or her level, language, and available time, then that person does become more sensitive to the value of and need for information. In this sense, information consolidation is also a striving to raise the consciousness and recognition of the important relation between information and development.

3.3 AVAILABILITY

In order to be eventually utilized, information has to be first available and second accessible. In respect to information systems, the concept of availability involves three distinct aspects:

1. Definition of information desired or needed for the predetermined tasks in order to enable selection from the existing public knowledge (or literature) or if nonexisting, to enable its generation or restructuring. Definition involves specifying characteristics of information such as: subject, type, level, language, etc.

2. Selection of information (or literature) from all that is in existence; decision on which particular items are to be included (or excluded) in a given information system based on (i) definition of desired or needed information and (ii) resources at hand.

3. Acquisition of the selected information (or literature) -- physical procurement of documents or other items recording information.

We shall concentrate here on the fundamental problems of defining information, while the other two aspects will be dealt with in the following Chapters.

What information is needed for development? This is a key question because the answer will determine the content of information files and resultant services of information systems. It is also a most difficult question to answer, thus, this is a major problem. The notion of consolidated information comes straight out of the attempts to reexamine the answers to this question within the last 4-5 years. One aspect that played an important role is that much information published in developed countries is not directly related to developing countries.

The rationale for answers is affected by many factors: goals and aspirations of development; recognition of the value and need for information in relation to given developmental endeavors; utilization of information (or lack thereof) in these endeavors; user needs; currency of national/international thinking on these matters; and the like. Rationale keeps changing and evolving (as does development itself) -- thus answers keep changing.

Here are some breakdowns of information for developmental needs as currently articulated:

1. In terms of information types, a distinction is made between need for:
    * Scientific and technical information; enabling learning, research, technical decisions, and actions.
    * Policy and management information; enabling decision on choices of alternate strategies and an increase in capabilities to manage, conduct business, negotiate, compare, evaluate, etc.; this may involve proprietary information as well.
    * Operational and industrial information; enabling production, maintenance, and services; this basically involves experiential information.
2. In terms of information use and transfer, a similar distinction as above is made between need for:
    * Know-why information; more scientifically oriented, generally readily found in the literature, and easy to transfer.
    * Know-how information; more technically oriented not so readily found in the literature, and harder to transfer.
    * Show-how information; more operationally oriented (training, maintenance, etc.,) rarely found in the literature and hardest to transfer because it involves not only information transfer per se, but technical and general education as well.
    * Know-who information; more personally oriented, reference to sources of information (people, organizations, directories, tables, "invisible colleges", etc.) for asking of specific questions; hard to find, easy to transfer.

3. As to information needed at different stages of development a distinction is made between need for:

- information for preindustrial or beginning industrialization stage, oriented more toward:
  - (i) basic decisions on choices and strategies;
  - (ii) diffusion of general knowledge on factors affecting each other in developmental efforts (e.g. sanitation and health); and
  - (iii) creation and diffusion of technical and experiential knowledge (know-how and show-how) needed to sustain developmental efforts.
- information for relatively advanced industrialization stage, oriented more toward:
  - (i) complex decisions, cooperation with other developing countries, negotiation, etc.
  - (ii) extension of the technical know-how
  - (iii) increase of employment and productivity, and
  - (iv) diversification, creation of new (and particularly small) industries and new products and markets.

Furthermore a much debated issue is the need for appropriate technology and with it (and inseparable from it) for appropriate information. The issue grew out of many failures and problems caused by attempts to transfer technologies which simply were not suited for situations in developing countries, although successful elsewhere. The question of the appropriateness of a given technology for local development is a complex issue. Often it is narrowly defined as a small-scale, labor intensive, low-cost technology which makes maximum use of local skills and resources. The concept is, however, broader than the above definition implies. It also represents a way of thinking about developmental problems and is not just a set of specific technologies. It requires that decision makers and problem solvers do not think of technology only as positive and "good-in-itself" but assess its values in relation to other aspects of life. It requires that the technological problem can be considered not solely as an economic and technical problem, but rather be seen from a larger, more holistic perspective taking into account the multi-leveled needs of human beings. Implicit in this concept is the idea of responsiblity to select, modify, and create technical solutions that will improve the quality of life with minimal negative impact. Also implicit is the realization that appropriate technology without appropriate information easily becomes unmanageable, unusable, uneconomic and thus becomes inappropriate.

As a result of these categorizations and debates a significant shift is occurring in developing countries as to the perceptions on needed information. The emphasis is not any more on the traditional international communication in science and science-related technology (know-why information), but on the acquisition and diffusion of knowledge directly appropriate to planning and advancing of national and local, economic and social development. A major characteristic of this shift is emphasis on information that falls into the categories of policy and management information, of operational and industrial information, of experiential and proprietary knowledge, of know-how, show-how, and know-who information - on appropriate information for short. Consolidated information is an expression of this shift in thinking. It is an attempt to derive and make available appropriate information, and it should be considered within such a framework.

3.4 ACCESSIBILITY

In order to be used, information must be not only available some place or other, it must be directly intellectually and physically accessible to users as well. To make the available information also accessible, information systems:

1. intellectually process such information: analyze, index, classify, organize, re-structure, re-process, synthesize, etc.
2. file, format, or package the information: house, publish, store in catalogs, computers, etc.
3. disseminate the information to users: circulate, provide selective dissemination of information (SDI) services, answer questions, etc.

We shall concentrate here on the fundamental problem of intellectual processing of information while treating the other two on a more operational basis in succeeding chapters.

Information sources are generally defined as primary and secondary sources. Primary sources are those where information first appears (journal articles, reports, books, etc.). Primary sources are affected by a high rate of growth, the so called "information explosion". Secondary information sources and services are those that have as their basic function the control of primary sources, particularly through various representations. Because of the information explosion, there is also an "explosion" of secondary information services in many subjects (e.g. current awareness services, online networks, clearinghouses, referral centers). Information technology is ever more used for these services; the international networks based on such technologies are reaching many developing countries (witness for instance INIS, AGRIS, MEDLINE, and others).

Today, no information system in the world exists as an island by itself, completely processing all information for access by its users, but each system depends to a variety of degrees on the available secondary information sources and on some network connection or other. However, the utility of the traditional information sources -- of both the primary and secondary literature of science and technology -- is considered low for appropriate information (as to the categories defined above) for developing countries. The degree of utility of existing primary and secondary literature is seen as directly corresponding to the degree of industrialization. The higher the degree of industrialization, the higher the utility of traditional sources. But the problem is that, unfortunately, the needed appropriate information is for the most part not readily available,as is the traditional secondary literature; and few information systems are devoted to appropriate information per se (in comparison to the total number of existing information systems, including libraries). Thus, the problem solvers in the developing countries are in need of additional post-processing of primary and secondary information, to make it conform to the problem difficulty. Information consolidation should be viewed as an intellectual post-processing of the available primary and secondary information to make it accessible to users, who otherwise would not access this information.

Intellectual processing and representation of information traditionally has attracted considerable theoretical, experimental, and practical attention worldwide, in both developed and developing countries. This refers to schemes, standards, methods, procedures, and formats for indexing, abstracting,classification, coding, cataloging, bibliographic control, and similar forms of intellectual representation (which we refer to as traditional forms of intellectual organization). However, consolidation of information, which is also a form of intellecutal re-processing of information, has not received much attention; thus it may be considered as non-traditional. As mentioned, there are few systems (such as some information analysis centers) that are actually devoted to any form of consolidation of information. Therefore, these procedures are by no means as well known,standardized, tested, practiced, or agreed upon as are those for the more traditional forms of intellectual organization mentioned above. Thus, this Handbook -- to provide some guidance for these non-traditional processes.

What is the relation between traditional and non-traditional forms of intellectual organization? Systems dealing with consolidation of information are heavily dependent on systems which process information by traditional means. Indexes and abstracts are needed for selection of inputs, libraries for access to original literature when needed, and so forth. In other words, consolidation of information is not in competition with traditional forms of intellectual organization. To the contrary, it can only be achieved in cooperation with traditional forms. It is hard even to imagine any consolidation effort that at some stage or another will not draw upon these traditional sources and services. It is not an either/or proposition. The proposition is: How to best use traditional forms of intellectual organization for a non-traditional consolidation?

3.5 UTILIZATION

The utilization of information in developing countries, even information which is readily available and accessible, is generally low. The Fourth UNISIST Meeting on the Planning and Implementation of National Information Activities in Science and Technology (Reston, Virginia, USA, May 1980) had as its main theme "Information for Problem Solving in Socio-Economic Development." The meeting concluded that the distinction between "information rich" and "information poor" countries is not necessarily a question of degree of possession so much as a question of degree of utilization of the information available. The meeting also concluded that availability and accessibility of information, disregarding local needs and differences, does not guarantee equitable distribution of benefits which could be obtained from its effective use. (3-25).

One of the most important themes on the evolving information scene is the need to take account of demand conditions in contrast to the heavy emphasis that has been placed on supply aspects. Even if information systems and services could give equal access to information, they would not have removed the differences in capacities to absorb and use information. Indigenous development requires more than the creation of stocks of information; it requires the use of information by people. No fixed organizational pattern or fixed solution can be prescribed to meet this requirement in light of the variety of needs and socio-economic conditions. The need is to bring about a number of solutions such as:

- More active involvement of information systems with user demand; studying the users more closely; evaluating services/products in terms of their use.
- Tailoring the variety of information services/products to the variety of user levels and demands.
- Enlarging the role of information specialists from information custodians to information intermediaries who provide guidance to users in formulation of demands and questions, searching, relevance judgements, analysis, and/or applications.
- Enlarging the spectrum of information covered to include sources and services relevant to little served groups (e.g. policy makers) and unserved groups (e.g. semi-literates, illiterates).
- Organizing information resources in ways that are more appropriate for socio-economic developments and presenting them in predigested, problem-oriented forms.
- Organizing mechanisms for more effective information delivery to problem solvers, employing information technologies and networks appropriate to their circumstances.

Thus in this framework, information consolidation has to be considered as just one in the spectrum of activities relevant to bringing about an increase in information use for development. It is not an information activity which stands alone, which could or should be planned by itself, or which is a universal panacea or solution. Specific types of information consolidation can be useful only as they are tied to specific user demands and other specific information services. But, as mentioned before, the prime impetus for information consolidation is the need to increase the utilization of information. This brings us finally to consider the value of consolidated information.

3.6 VALUE OF CONSOLIDATED INFORMATION

How can information consolidation be justified? Specifically through its value in given areas of problem solving and decision making and more generally through its value in the whole process of social and economic development. As mentioned, communication is essential to social change, and the value of consolidated information is that it can greatly affect social change in a positive manner.

But what values should be considered? The value in terms of economics alone, as is the present fashion? Clearly, economic values should be considered and the value of information mirrored against costs. Consolidated information does have cost benefits, and these should be shown and played up.

However, the concerns in development, in technology transfer, and similar activities often are and should be with values that cannot be measured in currencies and satisfied by monies alone. Value was conceived by Aristotle as composed of relatively equal portions of aesthetics, ethics, morality, politics, sociality, spirituality, and economics. Value, total human value, is a composite of many factors; and while considering the value of consolidated information, these many factors (in addition to economics) should be taken into account. Many failures of developmental efforts, such as in many attempts at technology transfer can be attributed to failure to match that technology with a given social setting, its information sophistication, and the total human values of that society.

The process of development, as defined today throughout the world, involves and requires an increase in sophistication in technical,scientific, and related information -- for understanding of specificity of concepts and relationships between concepts. The more developed a society is, the more specific are its concepts and the greater the understanding of interrelations. For example, the most advanced conceptualization or understanding of a tractor for a farmer in an underdeveloped area might be its function as a tool for plowing the ground, while his counterpart in a more developed setting might also be an accomplished tractor mechanic with an understanding of all the concepts involved in the engine, transmission,drive train, electrical system, accessories, etc., as well as awareness of the operational interrelatedness and interaction of all these subsystems. The lack of understanding on the part of the first farmer severely, and sometimes critically, limits his ability to utilize the technology. What is probably worse is that this lack of supporting technical information not only impacts on the economic value of the machine, (that is, directly inhibits the use of the machine) but also impacts on other social values as well. The results may prove to be disruptive to a society; they may produce anxiety and in the end worsening the human condition rather than development.

Many similar examples can be drawn from all levels of decision making and problem solving. They all point to the fact that the value of scientific, technical, commercial, and related information lies in its use and acceptance, which in turn rely on its appropriateness. And consolidated information aims at being appropriate. The aspects which influence value of information are deeply imbedded in the social and cultural structure and greatly exceed the economic interpretations, as important as economic factors are. The value of consolidated information is certainly economic, but the value may be even greater because it is related to other values in a society. The argument for consolidated information should in part rest on dollars, rupies, pesos, cruzeiros, shillings, and so forth; but even more so it should rest on values that represent other qualities of human life. The value of consolidated information is that it may contribute to information sophistication of a population, which in turn contributes to quality of life. For instance, consider the value of consolidated information that helps to improve sanitation, which in turn decreases disease, pain, and suffering.

The value of consolidated information can also be argued in relation to its role in decision making and problem solving. Making decisions and resolving problems (including those encountered in everyday work) require information; moreover:

* As complexity of decisions or problems increases, the need for information intensifies;
* As the amount of available information proliferates, it becomes harder to get and use relevant information;
* As complexity, interdisciplinary, and technical sophistication of available information increases, less can be used by decision makers and problem solvers as presented in its original form.

All this points to the need for consolidated information. But the value of consolidated information changes with the type and amount of information. To illustrate: a pile of documents on a given topic on a decision maker's desk, or in a worker's hand, has little value for the decisions they have to make on that topic or problems they have to solve, even though the documents may have all the information that is needed. Summaries may have a bit more value. Mergers from a number of documents may have still more value. Evaluated information further increases the value while studies addressing the topic (reviews, state-of-the-art, market studies, statistical summaries and correlations, etc.) increase this value considerably. The highest value of information is in a set of alternative choices summarized from all the other sources mentioned and recommendations for decisions or resolution of the problems. These relations are expressed in Figure 3-1. In other words,

* as the amount of information presented to a decision maker is more and more consolidated, its value increases;
* as the information is expressed more and more in the everyday language and the social/cultural framework of the user, its value increases for that user;
* as the information is more and more packaged in a way that will make its use easier, its value increases.

In summary, if communication is considered essential for social change, then consolidated information is also essential in the framework of the present status and goals of development. This, by the way, is the central theme of the Handbook.

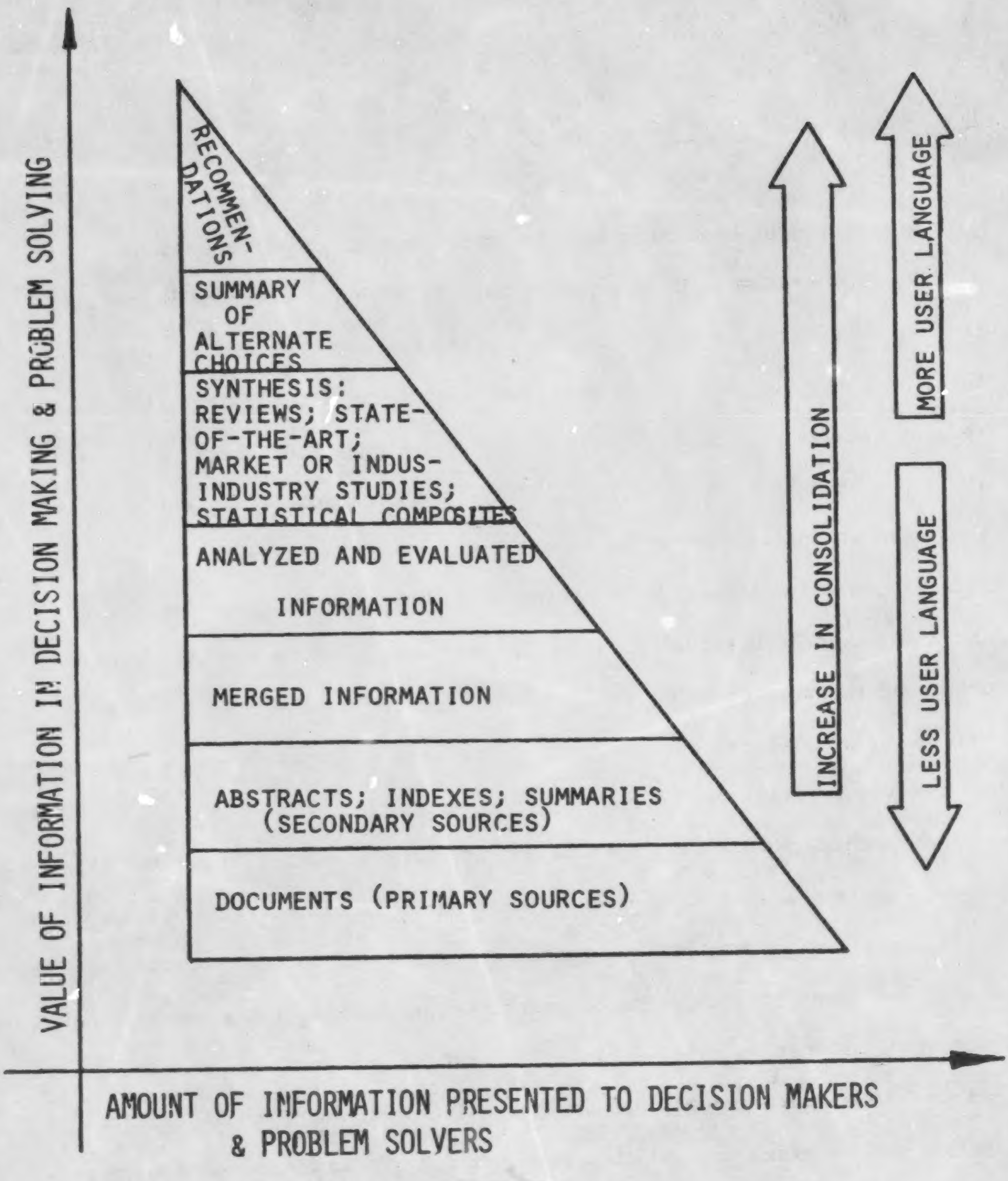
VALUE OF INFORMATION IN DECISION MAKING & PROBLEM SOLVING
RECOMMEN-DATIONS
SUMMARY OF ALTERNATE CHOICES
SYNTHESIS: REVIEWS; STATE-OF-THE-ART; MARKET OR INDUS-INDUSTRY STUDIES; STATISTICAL COMPOSITES
ANALYZED AND EVALUATED INFORMATION
MERGED INFORMATION
ABSTRACTS; INDEXES; SUMMARIES (SECONDARY SOURCES)
DOCUMENTS (PRIMARY SOURCES)
INCREASE IN CONSOLIDATION
MORE USER LANGUAGE
LESS USER LANGUAGE
AMOUNT OF INFORMATION PRESENTED TO DECISION MAKERS & PROBLEM SOLVERS

FIGURE 3-1: VALUE OF INFORMATION IN DECISION MAKING AND PROBLEM SOLVING

4. USERS AND USER STUDIES

4.1 OVERVIEW: THE NEED FOR USER STUDIES

Users are the beginning and the end of all information systems. This is taken for granted. However, what is not taken for granted in practice is that users have to be systematically studied and that the results have to be the base for design and provision of information services. President Kennedy once said: "The accumulation of knowledge is of little avail if it is not brought within the reach of those who can use it." Unfortunately, knowledge or information often is not brought within the reach of users because the systems that are supposed to do that neglected to look at the users first and consequently failed to make themselves compatible with the users and their information needs. Alvin Toffler said in *The Third Wave* that "many people feel cut off because the very packages in which information arrives are unfamiliar." (4-21).

As a rule, information systems and services succeed if they intuitively or deliberately adjust to users and their needs ... if they hit upon a need, be it conscious or not, well expressed or barely articulated, burning or latent and if they then provide competent services that will satisfy and even increase such need. Also as a rule, information systems and services fail when users and their information needs are not taken into account. Poorly designed systems and services may lead not only to lack of use but also to uncooperativeness and outright hostility on the part of the intended users. Systems and services can be adjusted even to users who have no or negative feeling toward information. But first, the users need to be studied.

A major problem on an international scale is that user studies have been well recognized and touted as needed, but this has ended more in lip service than in useful studies. There are four reasons for this:

1. Inborne expertise: by virtue of working with information, many people in or around information services consider themselves knowledgeable and expert about users and their needs. Thus, "user studies are really a waste of time to confirm that which we already know." Needless to say, this may not be correct.
2. Methodology: studying users is a very difficult methodological proposition. Theories in support of given methodologies do not exist (e.g. even for help in selection of factors for study) and the suggested models for viewing users and methods for studying them are not completely satisfactory; consequently, every methodology has serious shortcomings. Thus even a resolve to study users is often defeated by (a) objective deficiencies of present theories, models, and methodologies concerning users and (b) subjective lack of existing methodological knowledge and of necessary skills on the part of information system designers and operators.
3. Experience: the experiences with user studies that have been conducted are not that good. Many of them were trivial or useless. Many of them have been criticized for serious shortcomings, lacking methodological know-how and rigorous application of relevant methods from such areas as behavior research. Considerable dissatisfaction has been voiced about how studies of information users have been carried out in the past, because most have been merely descriptive about some variations between users, rather than providing insight about how information is being

diffused and used, what demands have been put to information systems and services, what satisfaction has resulted to users, or what was the impact of use of information systems on the users' work. Thus, user studies lost some of their credibility: "There is no use studying users, because so many previous studies were so bad." This attitude is a cop-out.

4. Translation: results of user studies cannot be automatically translated into appropriate information services. Rather considerable extrapolation, creativity, and trial-error testing are necessary. User studies are merely an aid in decisions about information services; they are not a substitute for decisions. Hence, expectations should be so geared. The real and challenging work for designers and operators of information systems only begins with results of user studies. Even the best user study is no guarantee that a successful information service will follow: "What good is a user study if it doesn't tell me straight away how to design and operate an information service?" This represented a fundamental misunderstanding about what any study can do.

In other words, a user study is a difficult and possibly a dubious proposition. However, there is a much, much higher probability (if not a certainty) that decisions and services based on good user studies will be better than those based on intuition, hearsay, or committee deliberations. Thus, the need for user studies. Know thy user is the first commandment of information services.

4.2 PLANNING A STUDY

How does one go about doing a user study? First, there should be a plan. It is important to plan a study carefully from the beginning to the very end and to lay out a detailed plan of each step ahead of any surveying, observing, and data collection. Plunging ahead without considerable planning is a sure prescription for a disaster, i.e. a useless or even misleading study.

The plan should consist of at least these steps:

PLANNING FOR A USERS STUDY:

1. *Surveying the previous studies and literature in general and learning about all aspects of user studies.*
2. *Determining the objectives of the study.*
3. *Determining the variables to be studied and the model to be followed.*
4. *Selecting the sample of the population to be studied.*
5. *Determining the method for collection of data of observation.*
6. *Determining the method of analysis of data or observations.*
7. *Determining the ways of presentation and utilization of results, including dissemination.*

The steps in the plan, except for the last one, are considered in the following sections of this chapter. The last step, being so important, is considered with examples in the next chapter.

4.3 SURVEYING THE PREVIOUS STUDIES

The mistakes in user studies start with inadequate knowledge of previous works about users and about the critiques of such works. The gathering and digesting of such knowledge may well start from the reviews of user studies that appeared in almost every volume of the Annual Review of Information Science and Technology, starting with volume 1 in 1966. Periodic reviews of user studies also appeared in well known international journals such as the Journal of Documentation, ASLIB Proceedings, and others. (See list of some more prominent reviews in the references.) Every major abstracting and indexing source in information science and librarianship has a section on user studies: these sources include: Library and Information Science Abstracts (LISA), Library Literature, Information Science Abstracts (ISA), Referativnyj Zhurnal: Informatika (English and Russian editions), etc.

4.4 STATEMENT OF OBJECTIVES

A study without clearly stated and adhered to objectives is like a fishing expedition in unchartered waters. Everything else that follows in a study - selection of variables to be studied, determination of methods, etc., is based on the objectives. Clear and specific statement of objectives is then a prerequisite (but not a guarantee) for successful selection and execution of all other aspects of the study, as enumerated under "Planning".

OBJECTIVES are value statements which explicitly describe the reasons for a study, the problem(s) to be addressed, expected achievements, and *limitations imposed upon the study.* Objectives may also be described in terms of their properties.

- Objectives follow from a problem, thus they require an analysis of the problem beforehand.
- They represent certain values, and as such they are based on given social, ethical, legal, and other sets of values.
- It follows that they may be subjective, not only in terms of the values used, but also, and probably even more so in the interpretation of these values. Thus, the objectives as stated may portray idealizations and not the "real" aims.
- Objectives may appear in hierarchies; there may be more than one objective to a study and consequently some objectives may take precedence over the others. Also the objectives may proceed from general to specific in a hierarchial way.
- Given objectives may be achieved in a number of different ways, i.e. there may be a number of solutions to the stated problem.
- Objectives are stated to achieve some expected results, however, quite often unexpected results may follow, thus given objectives cannot be tied to expected achievements only.

Objectives may be stated in a number of different ways: as enumerated statements, as questions, as hypotheses, as a narrative, etc. The following steps are involved in stating a set of objectives:

STATING OBJECTIVES:

1. *Analysis of the problem to be addressed and extraction of the aspect that can be and should be studied.*

2. Determination of the values on which the study is based.
3. Determination of desired achievements.
4. Determination of the limits of the study and any other constraints and requirements.
5. Deduction of a unifying statement summarizing all of these four aspects.
6. Ranking of objectives as to priority, if a number of them are involved or the determination of hierarchial arrangement - if they are to proceed from general to specific
7. Testing of the statement of objectives as to its logical soundness, clarity, realism, contradictions, reasonableness, etc., and redoing it if necessary.

4.5 MODELS AND VARIABLES: INFORMATION TRANSFER

A MODEL is a representation or analogy of a real or abstract object or process showing its essential elements, patterns, and/or relations. A model is used to study, manipulate, reproduce, or demonstrate the selected elements of the object or process while ignoring the others. A model is a simplification of a complex whole, an extraction of the essentials. This very simplification allows for a study which otherwise may be impractical, impossible, or confusing. What essentials will be extracted for a model, depend, of course, on that which is desired to be studied or observed. For instance, if it is desired to study human nutrition in a population a different model will be selected than if it is desired to study information diffusion in a population, even though both models will be based on human processes.

A model useful for user studies related to information systems and services should show the essential elements (factors, variables) which are involved in and produce effects on human information processing. Moreover, a model useful for a system dealing with information consolidation should be quite specific, showing the essential elements involved in diffusion or transfer of information. Unfortunately, such models are not readily available; thus, either adaptations have to be made or entirely new models invented. We will suggest here a model derived and extended from research on diffusion of innovations and transfer of technology.Many of the suggestions are derived from the work by Rogers (4-13) and Rogers and Shoemaker (4-12), as well as others listed in the references. We believe that particularly models developed by Rogers are useful for formulating the variables or factors involved in and effecting consolidation of information, because they have many analogies. Furthermore, diffusion of innovation and technology transfer is very dependent on consolidated information.

As mentioned, *DIFFUSION OR TRANSFER OF INFORMATION is a process by which an innovation or new idea spreads among the members of a social system -- it is a type of communication process. The diffusion process is the spread of a new idea from its source of invention, creation, or generation to its ultimate users or adopters, i.e. to the destinations or recipients.*

There are five essential elements in any analysis of the diffusion of an idea: (i) the innovation or idea (ii) which is communicated through certain channels (iii) from one individual to another (iv) in a social system (v) over time. This suggests the variables or factors that need to be examined in a user study:

VARIABLES
IN
USER
STUDIES:

1. *Stages or phases in the diffusion process*: they may differ over time, and as a result changes in information needs may be expected.
2. *Individual characteristics*: i.e. the factors or variables in the receivers of information that effect (i) the perception of the situation and need for information and (ii) the types of actions vis-a-vis information.
3. *Environmental or Social characteristics*: i.e. the factors or variables in the social system, (the norms, situation, reference groups, etc.) that have an important effect on (i) individual behavior and (ii) communication in general.
4. *Characteristics of an innovation or idea being diffused*: i.e. the perceived attributes of given ideas which will effect their adoption, acceptance, and very understanding.
5. *Communication characteristics*: i.e. the elements related to use and diffusion of information, particularly including: (i) information sources, (ii) information structures, (iii) information forms, (iv) communication channels, and (v) information systems. These are correlated with other variables.

Which specific variables will be stressed in a given study depends, of course, on the objectives of the study. The following pages (Sections 4.5.1 to 4.5.5) provide a more detailed description of these variables, or in other words, a model from which one can proceed in selection of specific aspects to be studied.

4.5.1 STAGES IN DIFFUSION PROCESS

The process of diffusion or transfer of information can be viewed as proceeding over time through a number of stages or phases which result in decisions, thus it is a type of a decision making process. Each stage has differing characteristics and may require support of different forms, including different types of consolidated information, and different communication channels. This underlines the importance of considering and studying the diffusion process in stages (i.e. over time) in relation to consolidation of information. Although discreet stages are enumerated below, it should be recognized that the process is a continuum with one stage flowing sometimes imperceptibly, into the next. The process of diffusion of information and associated decision making involves the following five stages (4-12):

DIFFUSION STAGES:

1. *Awareness: first exposure.*
2. *Interest/Knowledge: gathering of information.*
3. *Attitude Formation: development of feelings, mental evaluation.*
4. *Trial/Decision: probation, determination of further action.*
5. *Adoption/Confirmation: implementation, reinforcement of decision.*

1. Awareness: An individual (or group) is first exposed to an idea or innovation,he or she gains some understanding of how it functions, but lacks complete information about it. The awareness may happen either by active seeking of information or by a passive, incidental occurrence. There are two possible decision paths at this stage: to drop all further consideration or to develop further interest and knowledge about the idea or innovation.
2. Interest/Knowledge: The individual (or group) becomes interested in the new idea and actively seeks additional information so an attitude toward it can be formed. This can also be termed as an information or knowledge phase, because the function of this stage is mainly to increase the individual's information about the idea or innovation. The behavior is now definitely purposive. Decision makers personality, background, and values, as well as the norms of his social system may affect where he seeks information, what form of information is he willing to accept and capable of digesting, as well as how he interprets the information received.
3. Attitude Formation: The individual (or group) forms a favorable or unfavorable attitude toward the innovation and assesses it in terms of his own present or anticipated future situation. There is a psychological involvement with the innovation. He is unsure of the innovation and feels a need of reinforcement of his attitudes e.g. through opinions, advice, and information from peers. Perceived characteristics of innovation play a great role such as: relative advantage, compatibility, complexity, being testable or observable, etc.

4. Trial/Decision: The individual or group engages in activities which lead to a decision. Very rarely is an innovation adopted without trying it first on a probationary basis. Information is sought about methods for testing and trying the innovation and about ways for interpretation of results. The results of the trial are very important in the eventual decision on adoption or rejection, thus they have to be carefully handled in order not to be misinterpreted.

   A decision is made among these alternatives:

   (i) to adopt the innovation
   (ii) to reject the innovation
   (iii) to seek significant alteration or new ideas (i.e. return to the second stage)
   (iv) not to decide at all (i.e. possibly to opt for later adoption or rejection).

5. Adoption/Confirmation: The individual or group decides to continue the full use of innovation. Information is sought which (i) confirms the decision (ii) aids in full implementation, and (iii) exposes likely consequences. However, the decision may also be reversed if an individual is exposed to conflicting information about the innovation and its consequences. Information used is of two types: external and experiential. External information provides additional outside information about the innovation and its consequences. Experiential information is data accummulated from own experiences or from other adoptors. Experiential information is more credible to the adoptor, because it results from actual experiences in connection with implementation of an

innovation or idea. It can be convincing enough to cause a reversal of the decision.

Since diffusion is a time dependent process a further and important aspect to consider is the rate of adoption. The rate may differ from time to time, stage to stage, from one social group to another, from one individual to another and so forth. Therefore, it is important to study the rate of adoption and to isolate factors which may help or impede the acceleration of the rate for given innovations or ideas. Appropriate information sources are one of the factors that can significantly contribute to acceleration of the adoption rate.

In conclusion, the reason to model and then study the various stages of the process of diffusion or transfer of information is that the user needs can be expected to vary with stages and consequently an information service has to experiment with various types of information sources that are most appropriate at each stage. However, even though the concept of stages was confirmed as valid and existing in many research projects and observations, it is not fully confirmed how many stages there are and if they are as enumerated here. Thus, depending on the situation a different number or description of stages may be used.

4.5.2 INDIVIDUAL CHARACTERISTICS

Most of the user studies have concentrated on trying (i) to identify groups of people that have some individual characteristics in common and then (ii) to correlate them with some of their communication characteristics to find significant, general patterns. Some studies also included more complex correlations involving environmental and other variables described in the next section. Data for classification of individuals in user studies was collected in one or another of these classes:

INDIVIDUAL VARIABLES:

- *Demographic data:* age, sex, national origin, etc.
- *Social status data:* income and other economic aspects; status in a group; values; cultural traits; opinion leadership and gate-keeping position; cosmopolitanism (orientation outside or inside social group); etc.
- *Psychological data:* behavioral traits and patterns; personality; intelligence; mental ability and conceptual skills; decision making patterns; security-anxiety, etc.
- *Educational data:* level and subject of education; knowledge or skills in given topics; language and terminology proficiency in given subjects; literacy; numeracy; etc.
- *General work data:* place, type and subject of work; position; responsibilities and authorities; work times, habits, requirements; etc.

There are a great number of ways by which a group of individuals may be classified according to these individual characteristics. Some of these are more meaningful for correlation with the communication characteristics than others. One interesting way is to classify decision makers according to their propensity to accept innovation or new ideas. These five categories were deduced from data of a number of research studies.

CATEGORIES
OF
DECISION
MAKERS:

1. *Innovators (first individuals to adopt)*
2. *Early adopters (close to follow)*
3. *Early majority (just before the average member)*
4. *Late majority (after the average member)*
5. *Laggards (last to adopt)*

Figure 4-1 shows the often found normal distribution of these categories. Innovators are venturesome and communicate a lot on a cosmopolitan level (outside of immediate social group). Early adopters have the greatest degree of opinion leadership. Early majority are deliberate; they are also very important because they have a high degree of participation with their peers in all directions. Late majority are skeptical, they adopt new ideas out of economic necessity or under social pressure. Laggards are bound to tradition, they are the most locally oriented of all adopter categories and many are near-to-isolated. Early adopters are younger, have a higher social status, more favorable financial position, more specialized operations, and a higher mental ability, in comparison to later adoptors. Also, they have a more effective communication behavior. This is an example of partitioning a population which may have great implication for designing and direction of efforts in information consolidation, because a service may be designed that will concentrate on a group which has the greatest effect on the total population.

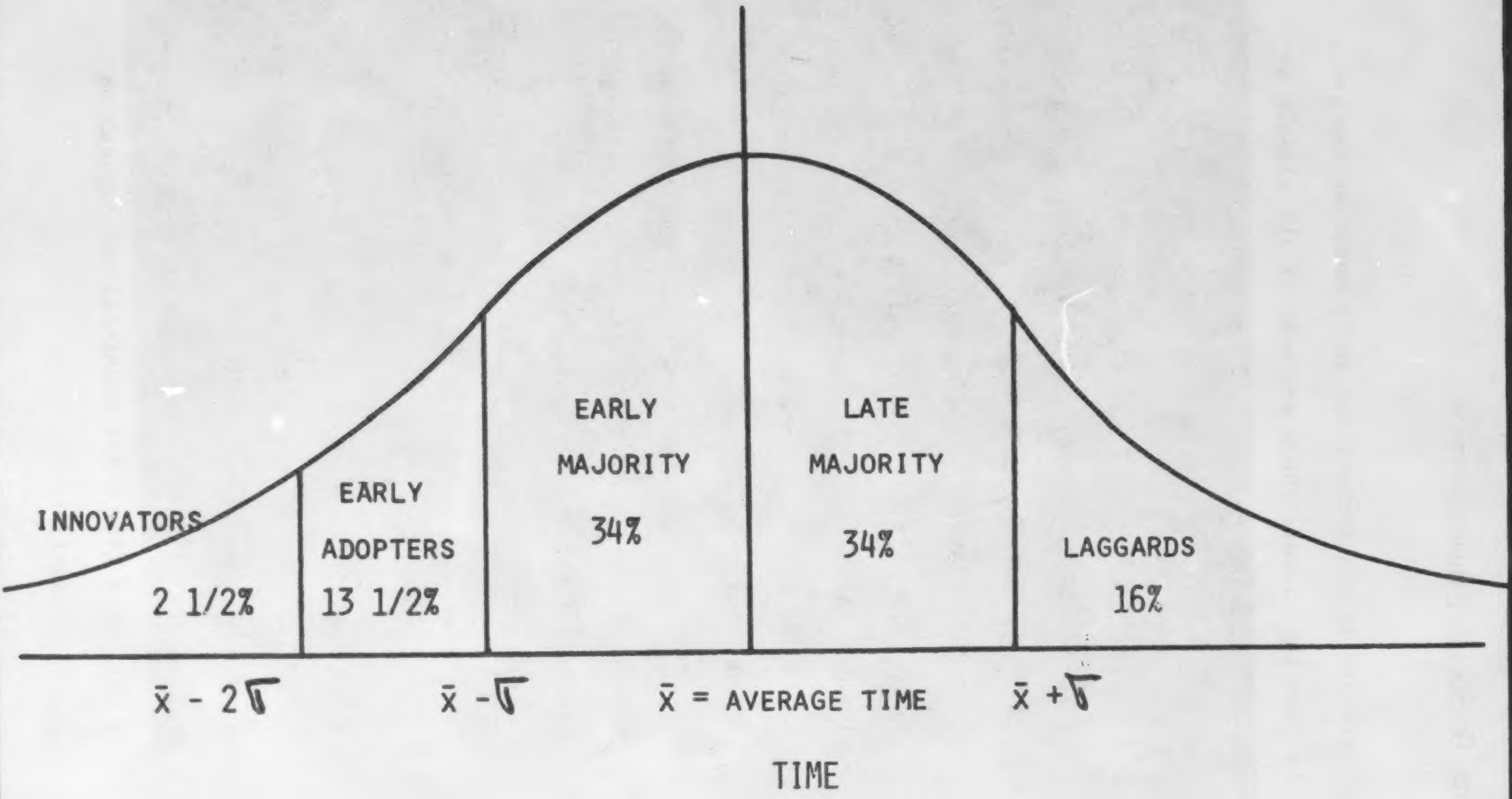

FIGURE 4-1 ADOPTER CATEGORIES BY RELATIVE TIME OF ADOPTION. TYPICAL STATISTICAL FINDINGS ON THE DISTRIBUTION AND NUMBER OF ADOPTERS. ($\bar{x}$ = MEAN, σ = STANDARD DEVIATION)

4.5.3 ENVIRONMENTAL OR SOCIAL CHARACTERISTICS

These factors characterize the society and environment of the group as a whole rather than the individual. Here are some of the classes of factors for which data was collected in user studies:

- Unit characteristics: data on places of work or habitat (farm, agency, industry, school); organizational patterns, authority-responsibility channels; products, services; requirements; etc.
- Social and cultural norms: cultural traits; social values; priorities; traditional-modern dimension; attitudes toward innovation; cross-cultural interactions and problems; etc.

ENVIRONMENTAL
SOCIAL
VARIABLES:

- Political aspects: political base and subdivision; developmental plans, attitudes, priorities; legal aspects; desired directions, etc.
- Economic aspects: constraints; incentives; incomes; productivity; projections; micro and macroeconomics of areas of interest; etc.
- Population data: demographic, educational, occupational, and other characteristics of the population; population trends.
- International aspects: comparative data about any of the above from other countries and regions or global interactions.

Culture and societal norms play a great role in diffusion of ideas and information transfer. They may be a help or a hindrance. They will provide for the most frequently occurring pattern of overt behavior for the members of a particular social system. In the traditional communication in science and technology (among scientists and technologists) these norms play a lesser role, because science in particular has developed its own norms which transcend national boundaries and even cultures and political systems (as described in Section 7.2). However, these norms play a much greater role in relation to consolidated information because it is aimed at a particular population or societal group of a given society. Thus, consolidated information has to be much more adjusted to social and cultural norms than traditional scientific and technical information.

4.5.4 CHARACTERISTICS OF AN IDEA OR INNOVATION

Some (but not many) user studies also examined the characteristics of a specific idea or innovation which in themselves affect the decision to adopt, the rate of adoption, and the communication process as a whole. User behavior and perceptions may and do differ from one innovation or idea to another. These characteristics have been examined in relation to:

IDEA OR INNOVATION VARIABLES:

* *Relative advantage: perceived advantage of the idea or innovation relative to current practices in terms of: economics, social status, health and well being, survival, etc.*

* *Compatibility: how easily can the idea or innovation*

be integrated and accepted in terms of: deviance from social norms, and from individual behavior norms; cost of implementation; etc.

- *Complexity: degree of complexity; importance of decisions in terms of resources and time; number of decisions to be made: series of related subordinate decisions, etc.*
- *Triability: possibilities; duration; cost; etc.*
- *Observability: ease of observing the benefits and impact; time involved; etc.*
- *Commitment: degree and extent of commitment necessary to adapt, (commitment in resources, time, risks, subsituations, etc.)*

The importance of studying these elements is underscored by a number of failures in transfer of technology. These failures occurred not because of the given technology per se, but because it has not met the acceptance levels related to the above characteristics in a given social group.

4.5.5 COMMUNICATION CHARACTERISTICS

Data reflective of the patterns of diffusion or preferences in use of information in a population (or among a group of individuals sharing some common characteristics) has been collected in all the user studies. Most often data has been collected in the following classes:

COMMUNICATION VARIABLES:

- *Information sources: where it appears*
- *Information structures: how it is represented*

- *Information forms:* how it is packaged.
- *Communication channels:* means of transmission.
- *Information systems:* systems involving any or all of these.

The factors studied in each of these include:

1. Information sources: frequency of use of source in given subject (such as dispersion of articles in a subject among journals); authorship pattern for a given subject; use of formal (or impersonal) sources by title, such as name of journals, reports, books, brochures, newsletters, pamphlets, advertisement, etc.; use of personal or informal sources by name, such as interpersonal contacts within and outside peer group, contacts with agents causing change (extension workers, opinion leaders, etc.); provision of sources; evaluation and rate of satisfaction; preferences; frustration in accessibility and availability; awareness of available sources; origin of sources; physical distances from sources; timelags in obtaining sources; estimated benefits; percevied needs, etc.
2. Information structures: preferences in and abilities to deduce from different information structures representing contents of information (titles, summaries, statistical condensates, reviews, texts as given, etc.); preferences for levels of presentation, logic of presentation, volume of provided information; level of information overload; tolerances and preferences in characteristics of information received (e.g. extent, range, accuracy, cost,

timeliness, etc.).

3. Information forms or packages: use and preferences for various media (modes) in which information is presented or packaged (print, hardcopy, offset, newsprint, microfilm, microfiche, soft image displays, audiovisuals, etc.); use and preferences for formats in which information is presented or packaged. Graphic design and layout; illustrations; demonstrations; etc.
4. Communication channels: use and preferences for methods by which information is transmitted, circulated, diffused; personal vs. impersonal channels; mass communication infrastructure and technology (telephone, postal services, radio, TV, etc.); computer interactions (batch, online); software; use of commands for searching; public and continuing education; training programs; etc.
5. Information systems: use and preferences in systems providing information sources in given structures and forms; accessibility; distances; desired characteristics; evaluation and ranking of various services; satisfaction and frustration in use; evaluation of policies; economics, charges, fees; marketing; user education; 'invisible college'.

Communication characteristics are, of course, what user studies are all about . However, the practical usefulness of a user study is not determined by how many communication characteristics have been studied, but by the correlation of very specific communication characteristics with specific other characteristics and by finding those combinations of elements which show significant patterns of use or diffusion or even better, those variables which affect significant changes. Correlations should be sought which show communication patterns and information use at different stages of the diffusion process for given groups of individuals; this is of greatest potential interest for decisions on a given type of consolidated information.

Figure 4-2 summarizes all of the variables described in this model of diffusion or transfer of information. It shows the array of elements of interest to user studies. As mentioned, which specific elements are to be selected for observation within a given study will depend on the objectives of the study.

4.6 METHODS FOR USER STUDIES

After it has been decided why to study users (objectives) and what to study (variables) comes logically the decision on how to do the study (methods). Thus, the selection of methods depends on previous decisions, on objectives of the study and on variables to be studied. Three aspects are involved in selection of methods:

1. Selection of a sample of user population.
2. Determination of procedures for collection of data from or about the sample.
3. Determination of procedures for analysis of collected data to derive or summarize results.

Each one of these has to be determined in great detail before one plunges into designing questionnaires or the collection of data. One of the most often commited mistakes (and a sure prescription for disaster) in user studies is to collect data without any idea of how they will be

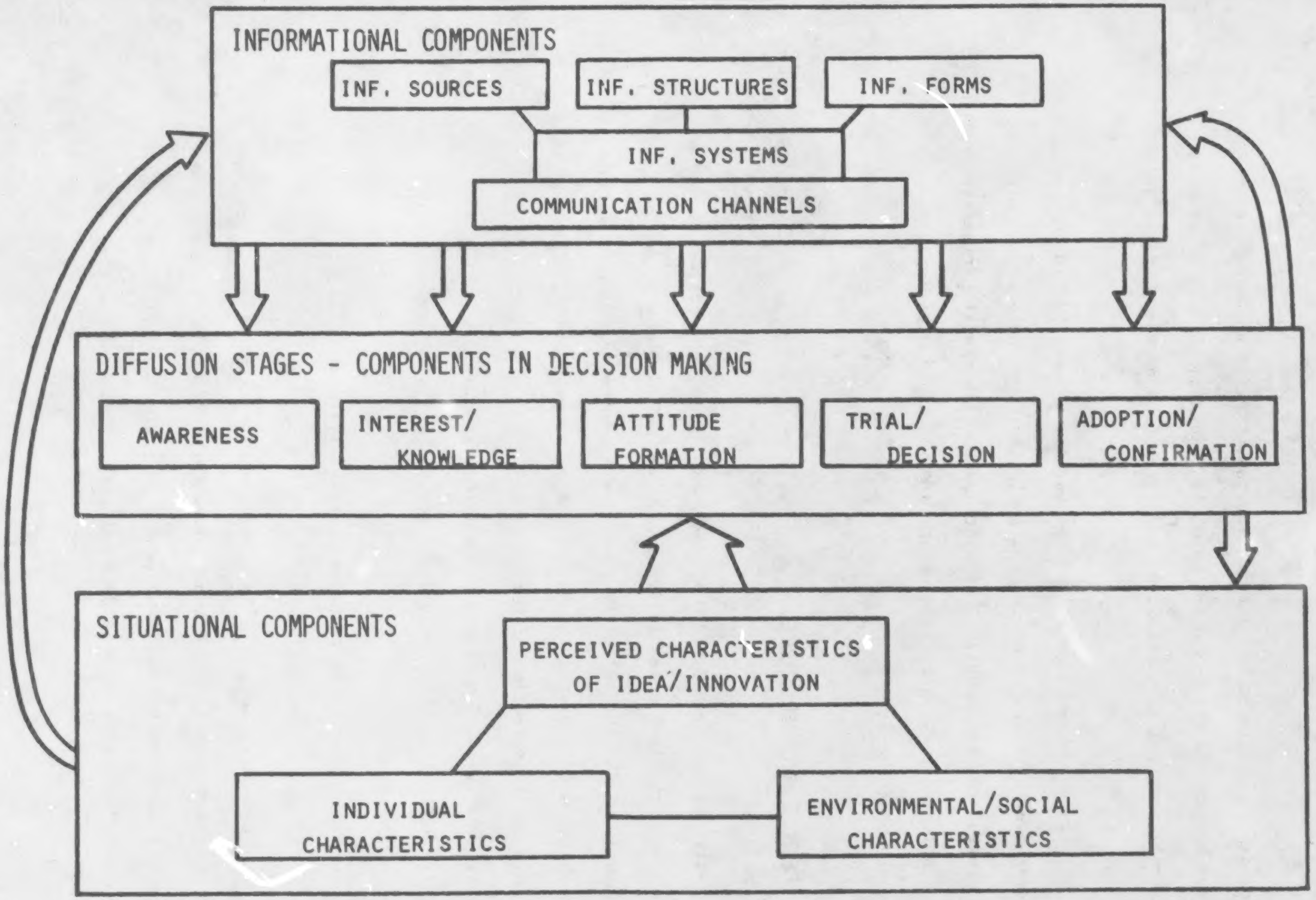

FIGURE 4-2 ELEMENTS IN DIFFUSION OR TRANSFER OF IDEAS AND INFORMATION

analysed. e.g. "Here we have a number of filled out questionnaires (surveys, interviews). Now, what should we do with them?" At that point a statistician may be contacted but it is much too late.

It is advisable to consult a statistician to help in the selection of methods. However, a user study should not be completely turned over to a statistician without experience in communication and/or users to be studied, because meaningless statistics will follow.

4.6.1 SAMPLING

Sampling is a branch of statistics that has many volumes written about its methods. The reason for sampling in studies is that in most cases it is impractical or even impossible to reach all of the members of a population. Usually, in practice, only a portion can be practically reached. However that portion should be representative (in respect to aspects studied) of the population as a whole, so that the results have a high statistical probability of being valid for the whole population. A bad sample equals biased, non-valid, and misleading results. In this lies the importance of judiciously selecting a representative sample. Of course, when the study concerns and isolated segment representing the whole population, such as a defined number of technicians in a factory, sampling is not relevant. But most user studies are not that limited in their population scope.

There is a number of sampling methods available, among the most common being:

METHODS OF SAMPLING:

1. *Convenience sampling: picking the first 25, 50, etc. users that come along as subject of study.*

2. *Random sampling*: *picking the users for study from a population at random.*
3. *Stratified sampling*: *subdividing the population into subgroups and then picking users for study at random from each subgroup.*
4. *Representative sampling*: *determining beforehand individuals, pairs of individuals, or small groups with some characteristics in common as subject of study.*

Each of these sampling methods has its advantages and disadvantages. None is universally "the best". Some are more appropriate for certain types of studies than others.

Another difficult proposition in sampling is determination of the size of the sample to be studied. Obviously, a smaller sample is more prone to produce biased results than a larger one. However, enlarging a sample after a certain size may not be very beneficial in obtaining results which are significantly more error free. Thus a 'happy' balance needs to be achieved, one that will on the one hand bring in results within some acceptable probability of error and on the other still be manageable enough to handle. within the limits of resources and time available for the study. Statistical formulas exist that show the degree of error which may result from a given size sample in relation to a given population. Let us describe now the four sampling methods in greater detail.

1. Convenience sampling: A certain number of users that come along (e.g. use a library or request information or walk on the street or participate in a class) are selected for study. This can also involve time (e.g. users using an information source or library

during 10 days). The advantages of this method lies in the fact that it is the easiest and most convenient method of sampling and sometimes the only method possible under constraints of some studies. The disadvantages are obvious: the group targeted for study may not be representative of a population as a whole; the sample may be biased.

2. Random sampling: the group targeted for study is selected at random from the entire population. This, of course, requires that first the targeted population (so called sampling frame) should be carefully defined and listed; if this cannot be done a random sample cannot be achieved. In that case, one has to use convenience sampling. A number of random selection methods are available: choosing every nth (e.g. 10th, 53rd) member of a population from a list; pulling names from a box or hat (which was well shaken before); using a table of random numbers to select members, etc. The advantage of random sampling is that it ensures that every member of a population has an equal likelihood of being studied. The disadvantage is that some important subgroups may be left more or less out of the study. For some types of studies (such as in most diffusion studies where connections are sought) random sample is not appropriate because it does not produce a sample of pairs or groups of individuals that are connected in communication.
3. Stratified sampling: this is a variation of the random sampling to ensure that all of the subgroups of interest are represented regardless of their proportion in the total population. (e.g. in a factory: workers, technicians, foremen, engineers, managers;

in a village: different occupations, different age groups). The population is subdivided into desired strata beforehand and a sample is selected at random from each stratum. The definition of strata becomes paramount for validity of results, thus studies on how to stratify a given population may have to be done beforehand. Some of the deficiencies existing in random sampling are eliminated. But it still remains that for some studies (such as those mentioned above) this method may not be appropriate.

4. Representative sampling: The method consists of choosing for study a group (or groups) that have some exhibited common characteristics and generalizing to the population which exhibits the same characteristics. For instance, choosing pairs of individuals communicating in a diffusion process who adopted and did not adopt an innovation, persons in a citation chain, command chain, etc. In a way, this is a stratified study but without random selection within a strata. The advantages are obvious: this study can be well targeted to specific communication practices and study objectives. The disadvantages are in the limited power for generalization and in a higher degree of possible bias in generalizations.

A big problem in all of user studies is the rate of responses or cooperation of the people selected for the sample. Lack of response in a certain stratum of a stratified sample can easily bias the results. For instance, if one of the strata includes a high proportion of people with a low literacy rate, and a written questionnaire is administered, it is highly likely that very few members in the strata will answer. Thus, the method of sampling and method of data collection have to be closely linked together to ensure an equal and possibly high level of response in all strata and thus avoid prejudiced results.

4.6.2 COLLECTION OF DATA

There are also a number of methods available for collection of data and a great number of textbooks describe those. The most often used are:

METHODS FOR DATA COLLECTION:

1. *__Surveying__: questioning users and obtaining answers directly from users about their behavior, attributes, values, conditions and/or preferences. This is by far the most often used method in user studies, but also the most obtrusive and thus potentially the most biased or limited of methods.*
2. *__Observation__: making direct observations on the communication behavior of users in given situations, practices, time periods, etc.*
3. *__Records Analysis__: obtaining written records or other artifacts of previous communications (such as papers, correspondence, statistics) and deriving observations about users from the records.*
4. *__Experimentation__: introducing an element of communication to a carefully defined group of users and observing the results or consequences; possibly also comparing the group with another where the element was not introduced.*

1. Surveying: may be formal or informal but both rest on a questionnaire. The construction of the questionnaire has to be done very carefully so that the questions (i) indeed reflect the variables to be studied and nothing else i.e. the questions should be to the point and no more; (ii) avoid different interpretations and misinterpretations i.e. the questions should be clear; (iii) avoid introduction of biases which may prejudice answers i.e. the questions should not be 'loaded' to predetermine answers. There are two main methods for administering a questionnaire: (i) self administered: a questionnaire is given to users or sent in fashion (e.g. through mail) to be filled by users themselves; the questionnaire is then either collected back or sent back by users. (ii) interview: the questions are asked orally in a face-to-face encounter between a user and a surveyor. The questionnaire still exists,of course, but the answers are recorded by the surveyor. In a more sophisticated situation the interview may be carried out by phone. The interview is much more costly and time consuming, but also it ensures a higher rate of return and more evenly obtained answers. However, it is not very suitable for mass surveys. Logically, there is a third method that combines the two: first a questionnaire is self administered followed by an interview. Any survey involves the following of a schedule. It should also involve a pretesting of the questionnaire and of the interview procedures to make sure they are on target,and to make the rather unavoidable revisions. The questionnaire itself may be precoded for easier data analysis; it may also involve

numerical ratings, comparisons, or rankings which could be subject to numerical analysis. The interview could also involve a panel of users; in a formal study this can involve sophisticated techniques such as the so called Delphi method.

2. Observation: again as in surveys this can be a formal or informal study, but either rests on careful predetermination of specific aspects to be observed and studied. That is, users cannot be just "observed" in general. Observation may include aspects such as: where users go for various kinds of information; what sources, structures, channels they use; with what frequency; what do they do with answers; whom do they inform, etc. The observations need to be recorded in a consistent manner over time. In some studies observations were made at random times (e.g. as a clock buzzes at random intervals, any user activities at that moment were observed and recorded). In some instances the users themselves can record some or all of the observations. The problem in recording by observers is to make the observations as unobtrusive as possible in order not to influence the user's behavior. Observation as a method is much more difficult than surveys, however, it has the advantage of recording what people do, rather than what they say they do. There may be great differences between the two.

3. Records Analysis: not all, but still a great many communication events leave behind some record or artifact. These records could be a goldmine for analyzing the communication behavior, information sources used, differences in the rate of adoption (e.g. of a drug by analyzing prescriptions by different doctors), connections

(e.g. by analyzing citations), and so forth. It is a particular form of observation, thus it has the same advantage over surveys: it is based on facts rather than opinions or recollections. However, it is limited to availability of records and often to willingness of users to part with such records.

4. Experimentation: this can be done only as a formal study and involves setting up controlled conditions for introduction and observation of a carefully determined information source or communication practice. Included may be a control group and comparison of results between the control and experimental group. It is the most difficult of all methods, but also one with the greatest potential yield in information. Rules for experimentation in sciences pertain to this method.

4.6.3 ANALYSIS OF DATA

Collecting data is not enough. In order to be useful data has to be summarized, compared, synthesized, tested for significance and otherwise manipulated or "massaged". Data anlaysis is another one of the complex tasks in user studies, wrought with many difficulties and hidden traps as all the others. Many an analysis is informal, in that it consists of gaining an impression or feeling of what the data indicate and in which direction they point. For the formal analysis the most often used methods are:

FORMAL METHODS FOR DATA ANALYSIS:

1. *Statistical analysis: application of standard statistical techniques to summarize, compare and test for significance data which is expressed numerically.*

2. *Semantic analysis*: application of semantic techniques to summarize and compare data which is expressed verbally.
3. *Psycho-sociological analysis*: application of psychological, sociological, or anthropological techniques to classify or describe data which is expressed conceptually, logically, or representatively.
4. *Economic analysis*: application of macro or micro-economic techniques to derive conclusions in economic terms on data expressed in either or all of the above ways.

Each of these formal analysis methods do require knowledge of the respective fields, although elementary statistical and semantic analysis can be accomplished rather easily with a rudimentary knowledge of statistics and of semantic differentials. Standard statistical packages are widely available which will accomplish calculations of sums, means, medians, variances, standard deviations, percentages, chi-squares, regressions, or cross-tabulations of data. Standard semantic analysis techniques are not available, however, appropriate techniques can be adapted relatively easily from the myriad of previous user studies.

In all of the formal analysis methods data has to be expressed in a form that allows for manipulations in analysis. It is thus imperative to consider analysis methods and at the same time consider data collection methods. In other words, although sampling, data collection, and data analysis are different aspects of methodology for user studies, they are all interconnected in such a way that they have to be considered in relation to one another.

4.7 LIMITS OF USER STUDIES

User studies can uncover a tremendous amount of useful information. However, there are limits to what they can uncover and how far predictions can be made. This is for at least three reasons:

1. The very problems confronting the users change; the directions of changes cannot be always anticipated by users or anybody else.
2. Decision making is not a perfectly rational process; there may be aspects to it that defy logical analysis as found in user studies.
3. The human psyche and social conditions change in response to unforseeable factors and in unanticipated ways.

All of these cannot be handled by user studies. There is an element in information needs and uses that is uncertain i.e. it is neither predictable nor studyable. In other words, it is not possible to find standard procedures that will fully reveal the individual users' needs and predict changes. Thus, a continuous and dynamic partnership, individualized contact and flexibility are needed between users and information systems.

5. FROM USER STUDIES TO INFORMATION CONSOLIDATION PRODUCTS

5.1 OVERVIEW

Results from a user study are in. Now what? Now comes the difficult and creative task of using the results in determining and developing information products that will satisfy the uncovered user needs in given subjects - that is, products that on the one hand will fit with the communication practices of users and on the other will reflect the state of knowledge or information in the given subject. Thus the information consolidation products are determined with one eye on the user and with the other eye on the best available information on the subject. On the operational level naturally, development of a product has to involve definition of processes and procedures by which the product will come into being and of a unit that will carry out these processes.

In this chapter we are concentrating on a summary description of a variety of possible information consolidation products (i.e. tangible outputs of information consolidation units) as they relate to user studies. Therefore, it is logical to present these descriptions immediately following the chapter on users. In particular, the description of characteristics and types of products is related to the different stages in diffusion process and possible different organizational units of users (as described in Sections 4.4.1 and 4.4.3). In the following chapters the concentration is on the selection and evaluation processes and on the detail descriptions and procedures involved in some of the most popular products and packages.

5.2 TARGETING TO DIFFUSION STAGES

Targeting means orienting specific information products to specific audiences, organizational units, events in information transfer, etc. When the specific concern is with diffusion of innovation or ideas, one of the important ways of targeting is adjusting the product(s) to correspond to information needs in different stages of the diffusion process. As mentioned, diffusion may be partitioned into five stages or phases: 1. Awareness, 2. Interest/Knowledge, 3. Attitude formation, 4. Trial/Decision, and 5. Adoption/Confirmation. The role and purpose of the products at each stage differ considerably; they may be described as follows:

1. Awareness: exposing the users to the general existence of an innovation or idea. Creating general consciousness through examples. Fixing attention and guiding the users to the next and more substantive sources of information.
2. Interest/Knowledge: Awakening further interest. Providing basic details of the innovation or idea (e.g. technology). Creating a cognizance of the knowledge, know-how and steps needed for trial and adoption. Guiding to sources that will stimulate further learning and eventual trial, and decisions on adaptation.
3. Attitude Formation: relating the innovation or idea to user needs and functional answers within users' situation. Informing the users of the general utility of the idea or innovations. Giving enough detail to compare this idea or innovation to others in users' own environment. Guiding the users to information

sources that will generate appraisal, trial, and decisions and persuading them to do so.

4. Trial/Decision: providing applied details to measure performance or applicability of the innovation against requirements. Assisting the users in obtaining evaluations i.e. performance data on the specific utility of the innovation to their particular situation. Directing the users to sources that facilitate trial and decisions. Guiding them to sources for additional technical or operational details.
5. Adoption/Confirmation: providing information confirming users' decision and reducing dissonance. Providing continuing information to satisfy requirements of the modified environment of users (i.e. as changed after adoption). Directing the users to sources of continuing operational support and/or providing such sources.

Clearly, products for each stage should correspond to user needs for that stage. However, at each stage there should be a pointer which will guide the user to the information needed to continue onto the next stage. As users proceed through the diffusion stages (from awareness to confirmation) information requirements become more specific and thus information products tend to become more specific and even more personal. More specific products can serve less specific needs but not the reverse i.e. an information product directed toward attitude formation can serve also as an awareness product, but not vice versa. However, specific products do cost more than general products, thus, it is not cost-effective to use more specific products for more general needs. Furthermore, a more specific product may not be appropriate for a general stage because it places a burden on the users who are provided with more information than they need at that particular stage.

5.3 CONTENT ASPECTS

As restructuring of information is one of the major subprocesses included in information consolidation (as defined in Section 2.6) it involves presenting the consolidated information (i.e. the contents of an information consolidation product) in a way that will be most compatible with the situation and user needs. In general, all types of restructuring follow a particular scheme: the original text or texts undergo certain processes so that the product is a much shorter text in respect to some predetermined factors than the originals.

Among the great number of aspects or facets to consider in relation to the contents in a given information consolidation product, the following stand out:

CONTENT ASPECTS OF INFORMATION CONSOLIDATION PRODUCTS:

1. *Content extent and degree of reduction*
2. *Technical Sophistication*
3. *Temporal aspects*
4. *Editorial qualities*
5. *Information quality and accuracy*
6. *Degree of invariability or value added*
7. *Degree of linearity*

1. Content Extent: this signifies the decision on the degree of detail with which a subject is treated and/or reduced in a given information product.

Two dimensions are involved:

- Subject breadth, ranging from
  - General: broad presentation of topics or problems involved in the subject, to
  - Specific: narrow, limited to a specific topic or problem.
- Subject depth, ranging from:
  - Summarized: shallow, selective, highlighted, filtered treatment,to
  - Detailed: full, comprehensive, in depth treatment.

2. Technical Sophistication: defines the technical level and understandability of the contents of an information consolidation product. Four points on a continuum are involved:

- Minimal:
  - introduces a single or very few concepts or aspects of a topic and
  - employs no technical jargon or esosteric terminology
- Moderate:
  - introduces several concepts or aspects of a topic, and
  - employs some technical terminology, carefully defined and logically introduced
- High:
  - encompasses virtually all essential concepts or aspects of a topic; and
  - makes liberal use of technical terminology
- Very High:
  - includes discussion of complex relations with other topics or subjects and of long range consequences; and
  - makes liberal use of concepts and terminology from other subjects

3. Temporal Aspects: describes the two basic time dimensions involved:

- Timeliness or currency and time spans of information incorporated in a product:

- immediate: appeared within a short period, such as six months
- current: within the last year or so
- retrospective: prior to a year and extending to a defined historical period

*Frequency of issue of the product:

- one time only
- periodic update, but without defined regular time periods
- defined periodic issues (monthly, quarterly, annually)
- response time (if a product is in response to a request)

4. Editorial Qualities: this includes a number of qualitative aspects associated with the style of presentation - the prime function of this facet is to make the contents more palatable to users and easier to assimilate. Involved are aspects such as:

* grammar, syntax
* clarity, crispness
* balance, contrast
* logical organization, coherence
* layout
* graphic qualities, composition, color

5. Information Quality and Accuracy: the degree of known validity and reliability i.e. the quality of information or data presented in the product. Involves evaluation of information prior to consolidation in a product. For instance, an information product perfect in any other way, can still contain inaccurate information.

6. Degree of Invariability or Value Added: the degree to which information is presented as contained in the original text(s). When evaluation is performed

the degree of value added (points of view, comparisons, results of tests, judgements, etc.).

7. Degree of Linearity: the degree to which the order of presentation in the product is the same as the order in the original text(s).

5.4 PACKAGING AND DISSEMINATION ASPECTS[1]

Packaging and/or repackaging or restructured information is another one of the major subprocesses in making an information consolidation product. It involves presenting the restructured information in a form that will enhance the potential of its use. Two aspects can be distinguished:

ASPECTS IN PACKAGING	*1. Package media*
OF INFORMATION:	*2. Package formats*

1. Package Media: the reference here is to the physical medium in which the information is displayed or presented to users. The most common media for presenting information are:

- Print, further subdivided into:
    - paper hard copy
    - filmed copy
    - soft image display
- Audiovisuals
- Demonstrations
- Interpersonal contact

---

[1] Chapters 11 and 12 deal in greater detail with these topics. Only basic details are given here so that examples can be provided.

* Combination of any of the above

It is important to note that information consolidation products are not exclusively related to the print medium. To the contrary, other media should be considered and actively explored. In many instances they may be more appropriate to given user groups and situations than the printed page. For instance radio is popular and quite widespread in many developing countries thus radio programs can reach even remote villages. TV is similarly becoming widespread, particularly in urban centers. Film was always popular.

2. Package Formats: this refers to the shape and make-up of the physical presentation of an information consolidation product. Within each media many formats for arranging, and presenting information are available. Clearly, the choice of a particular format should reflect not only the physical medium but also (i) the content and nature of information to be presented, (ii) the users and their environment and (iii) the means or channels of distribution of and user access to information.

Dissemination or delivery of information products is still another process to be considered in an integral fashion. That is, development and creation of an information consolidation product has to be coupled with consideration of means by which this product will be put in the hands of users. A channel for dissemination refers to the means of transition or mechanism by which information products are distributed and delivered to users. As mentioned, there is a close connection between the choice of media, formats, and respective channel or channels.

The channels can be divided as:

DISSEMINATION CHANNELS: *1. Interpersonal delivery: products personally delivered to each user.*

2. Group personal delivery: products given to users at meetings, demonstrations, etc.
3. Strategic placements: products put at key sites for users to pick up, (includes possible distribution of products through stores), etc.
4. Mail and other means of public distribution.

DISSEMINATION CHANNELS CONTINUED:

5. Local depository: products circulated from a library, extension service, etc.
6. News media.
7. Broadcasting: radio, tv.
8. Telecommunications: telephone, satellite, etc.
9. Computer networks: Online systems, computer conferencing.

5.5 EXAMPLES

Table 5-1 provides examples of different information consolidation products within different media.

Table 5-2 provides examples of information consolidation products as they are appropriate for a number of different types of user organizations and as they relate to the five stages in diffusion of innovations or ideas. These examples were derived from (5-2).

TABLE 5-1: EXAMPLES OF INFORMATION CONSOLIDATION PRODUCTS IN DIFFERENT MEDIA

Media	Aspect	Product
Print - paper, hard copy	Single issue (Temporal aspect)	Critical review or state-of-the-art
		Brochure
		Monograph
		Technical report
		Field manual (for operations, maintenance, processes)
		Guide
		Handbook
		Textbook; tutorial
		Question-Answer sheet
		Data compilation; critical data
		Statistical abstract
		Briefing; evaluative summary
		Directory; evaluative answers
		Referral; evaluative answers
		Printout; any of the above
	Serial (Temporal aspect)	Newsletter; alerting bulletin
		Journal
		Monthly, quarterly... report
		Recurring summaries, bulletins
Print - filmed copy	Microform	Microfilm; any of the above
		Microfiche; any of the above
		Aperture card; any of the above
		Microtext; any of the above
Print - soft copy	Cathode ray tube	Online retrieval-references, paragraphs
		Structural compositions
		Tabular data
		Video newsletter
Audio	Recording	Tape Cassette Phonodisc } of a tutorial, briefing, guide, etc.
	Telephone recorded message (dissemination-delivery)	Briefing; summary
		Question-Answer session
		Newsletter
		Information 'Hotline'
	Radio (dissemination-delivery)	Summary; tutorial
		Newsletter
		Radio show

TABLE 5-1 CONTINUED

Media	Aspect	Product
Visual	Graphics	Photograph
		Drawing; chart
		Poster
		Display
		Slide
		Transparency
		Table; figure
Audiovisual	Film	Motion picture
		Slide and recording
		Holograph
	Video	Videotape
		Videodisc
	TV (dissemination-delivery)	Summary; advice; tutorial
		Newsletter; briefing
		TV show
Demonstration	Fixed site	Modeling - processes, procedures, applications
		Test/laboratory facility
		Trial installation
		Pilot plant
		Exhibit
	Nonfixed site	Mobile demonstration unit
		Scale model
Interpersonal	Group contact (dissemination-delivery)	Lecture/talk
		Seminar/conference
		Tutorial
	Individual contact (dissemination-delivery)	Personal consulting/advice
		Correspondence
		Telephone conversation
		Staff visit

TABLE 5-2: EXAMPLES OF INFORMATION CONSOLIDATION

Products by Diffusion Stages

Type of Organization	Awareness	Interest/ Knowledge	Attitude Formation	Trial/ Decision	Adoption/ Confirmation
Small Industry	Advertising announcing reports on a particular product/process. Promotional brochure. Newsletter.	Reports. Group seminar. Visits. Briefings. Exhibit. Synthesis of requirements. Data.	Seminar on effects. Comparative statistics. Report on alternatives and experiences. Videotapes, films.	Demonstration. Technical manuals. Graphic displays. Data books. Handbooks.	Operational manuals. Market reports. Handbook.
Medium Industry	Brochure describing product/process of interest to technical personnel. Market description for managers.	State-of-the-art review describing technology. Resource and economic analysis or summary.	Comparative experiences. Critiques. Market analysis.	Demonstration. Technical assistance manuals. Films, tapes, pictures. Data books.	Operational manuals. Updates. Trends. Synthesis of advances. Handbook.
Large Industry	Alerting bulletins. Newsletter. Technical news synthesis. Market trends.	Individual seminar on new developments. State-of-the-art. Economic analysis. Synthesis of research results. Critical data. Reply to inquiry.	Competitive analysis. Impact analysis. Historical review of similar efforts. Evaluations.	Demonstration. Testing reports. Technical manuals. Training manuals. Tables of recommended data.	Operational manuals for different levels of personnel. SDI synthesis of advances. Continuous critical and recommended data.

TABLE 5-2 - CONTINUED

Type of Organization	Awareness	Interest/ Knowledge	Attitude Formation	Trial/ Decision	Adoption/ Confirmation
Local Government	Promotional brochure. Press release. Newsletter announcing reports on topics of local interest.	Workshop for officials. Reviews. Statistical synthesis. Visits. Analysis/synthesis of practices.	Impact analysis. Comparative data. Demonstration. Briefing.	Manuals for implementation. Comparative experiences. Referral. Documentation.	Recurring supply of synthesized information. Establishment of question-answering procedures.
State Government	Announcements. Form letters. Presentation at meetings. Newsletter. Alerting bulletin.	Slide/tape descriptions. Briefing. Reviews. Statistical composites. Synthesis of research findings. Data tables.	Historical data. Comparison with other countries. Demonstration. Impact analysis. Evaluations. Integrative future studies.	Synthesis of practices and trials. Manuals. Referral. Documentation.	Recurring supply of synthesized information. Evaluation reports.
Mass Urban Population	Newspaper articles. Announcements on radio, TV. Popular talks on a given practice or product. Question-answer sheets.	Radio, TV, shows. Popularization articles. Simplified pamphlets, brochures. Comic strips. Photonovels. Demonstrations. Exhibits. Popularized journals. Field manuals.	Comparing with other practices. Demonstrations. Synthesis of fitting with daily life. Possible impacts, positive and negative.	Show-how information. Simplified manuals. Do-it-yourself booklet.	Synthesized informatio fortifying and refining the practic

TABLE 5-2 - CONTINUED

Types of Organization	Awareness	Interest/ Knowledge	Attitude Formation	Trial/ Decision	Adoption/ Confirmation
Mass Village Population	Radio announcements. Visits with opinion leaders. Posters, graphic displays. School talks. Training sessions for extension workers.	Extension service demonstrations. Simplified pamphlets. Field manuals in various media (e.g. picture books, comic strips). Graphic displays. Films. Talks.	Talks by opinion leaders. Comparison with other villages. Synthesis of fitting with village life. Impacts. Summary.	Show-how information. Field manuals. Experiential information. Markets for cash crops. Do-it-yourself booklets.	Reinforcement information. Comparisons. Refinements. Increased know-how information. Market enlargement information.
News Media	Press release. Invitation to demonstration. Press clippings from foreign or technical press. Alerting bulletin.	Demonstration. Popularized articles. Synthesis of findings and results elsewhere. Timetables. Plans.	Graphic material. Comparative data. Briefings and news conferences.	Short guides. Interviews with experts, leaders.	Reports on applications. Articles on refinements. Result analysis. Impact analysis.
Academic/ Research Institutions	Journal notices. Short announcements in professional newsletters. Acquisition notices.	State-of-the-art and critical reviews. Synthesized research results. Referral. Journal articles. Text excerpts. Critical data. Data survey.	Synthesis of critical reports and evaluations. Comparative results. Resource requirements information.	Research data. Training/education materials. Know-why information. Experiences at other institutions.	Continuing synthesized SDI reports. Selective current contents. Refinements in advances. Critical data.

6. SELECTION OF INFORMATION SOURCES

6.1 OVERVIEW

The processes and problems of consolidation do not start with how to consolidate but with what to consolidate. Selection which incorporates evaluation is a basic, essential and inseparable part of consolidation of information.

> *EVALUATION is a judgment on the intrinsic merit, validity, and reliability of information and/or of information sources.*
>
> *SELECTION is a decision whether the information or information sources are of utility and meet the needs of users, including considerations of economic and other restrictions.*

In other words, evaluation considers the value of information and information sources per se and selection matches them to specific users on the basis of utility, appropriateness, and given constraints (such as moneys available for acquisition). Although based on different considerations, in practice evaluation and selection are so intertwined that quite often no practical distinction is made between the two. It is like looking at two aspects at the same time and matching them for a decision. We shall deal with selection in this chapter and with evaluation in the next one. The reason for treating evaluation in a separate chapter after selection is that evaluation is related on the one hand to selection and on the other it is also related to analysis and synthesis (treated in Chapter 8).

Selection involves at least these three elements:

ELEMENTS IN SELECTION:

1. *Selection policy:* a set of criteria and principles adopted and used by an information system for decisions on acceptance and rejection of information sources. It is a statement aiding a judgment (but not a substitution for it) on inclusions into and exclusions from information consolidation.
2. *Selection aids:* the tools employed in selection, evaluation and verification.
3. *Selection process:* the people, methods and procedures used in arriving at decisions.

Selection is always present in any and all information systems and particularly in information consolidation units...be it recognized as such or not, be it done consciously or subconsciously, formally or informally, with or without articulate criteria. The importance of selection is quite clear: it determines the contents of an information file. Unfortunately, one of the often found weaknesses in many information systems is inadequate attention paid to criteria and methods for selection, particularly in comparison to the great attention paid to later processes in connection with materials that have been selected (such as indexing, abstracting, computer processing, reviewing, etc.).

6.2 SELECTION POLICY

Selection policy sets the criteria and basis for decisions. A detailed articulation of criteria for selection is by no means an easy proposition. Therefore, it is not surprising that many systems perform selection on the basis of unstated criteria and instinct. The results may not necessarily be bad, but they are more likely to be so. There are no universal formulas for selection. Any selection involves human judgment, thus a degree of subjectivity. A well stated and officially approved policy:

* helps in reducing the inconsistencies and idiosyncracies in judgments;
* guards against gaps and biases in decisions;
* provides for more equivalence in judgments among different selectors and across a span of time;
* represents the system to its constituency and higher authorities;
* serves as a tool in communication with users as well as in promotion and marketing to users;
* provides a benchmark for evaluation of the system; also, it can be used as an answer to unjustified or uninformed criticism;
* aids in training of staff.

A policy should have at least these three elements (of course it can have more dependency on the objectives of the system):

ELEMENTS IN A SELECTION POLICY:

1. *Users and needs: a specific statement about population and information needs to be served.*
2. *Subject: a specific statement about subjects, topics, problem areas or missions to be covered.*
3. *Materials: a specific statement about the type of information sources in the given subjects to be acquired and the criteria for their evaluation.*

1. Users and user needs. This involves stating in some detail the aspects of users and uses which form the foundation for selection and even for the very

existence of the system. The basis for development of a policy should be the results of user studies and community analysis. The higher the degree of selectivity in a system the more important it becomes to have a detailed statement about users and uses. The statements about users can be organized around the list of variables as elaborated in Section 4.4. These statements are to be used as an aid in answering questions such as: What is the utility, usefulness, appropriateness...of given information or information sources to users? What factors (individual, social, political, work, cultural...) should be considered? What priorities given?

2. Subject. This involves stating in some detail the topics in which information and information sources are to be collected. It is a statement about the contents of a system. Very often a distinction is made between two types of information systems according to subject coverage:

(i) Discipline oriented: coverage of the subjects that present the traditional areas of learning: chemistry, metallurgy, electrical engineering, ferrocement, mining, viral hepatitis, linguistics, etc.

(ii) Mission or problem oriented: interdisciplinary or multidisciplinary coverage involving a number of subjects and topics relevant to a specific problem, a commodity, or activity, e.g. rubber, rice, renewable energy, irrigation, business, transportation, sanitation, alcoholism, government, legislation, appropriate technologies, etc.

Definition of discipline coverage includes specification of (i) a core of topics and (ii) of boundaries. Each discipline has a core of relatively easily defined topics, the problem arises in defining the borderline areas, and the extent to which the coverage should include related topics from other subjects. As modern subjects interrelate more and more, definition of boundaries become ever more difficult.

But the real difficulties arise in content definition of mission or problem oriented systems. The core is much weaker and in most cases there are a number of cores, the directions are more diffused, and the boundaries are hazier. Often the relevance of a topic to the problem cannot be determined beforehand by definition alone, but it is decided as one stumbles upon it by serendipity. The approach to defining the mission coverage involves an extensive inventory of topics relevant to the mission or problem and then a subdivision into central core areas, extended core areas and finally boundaries in concentric circles to each core and/or to the problem as a whole.

In cases where data is collected, evaluated and synthesized the definition involves specification of characteristics or properties (of materials, entities, etc.) on which data will be selected.

3. Materials. This involves stating the details about the information sources to be collected i.e. the actual sources from which information consolidation will be made. In some instances this can involve an inventory, e.g. a list of journals from which selection will be made. In other instances given characteristics of sources are enumerated, e.g. language, country of origin, publishing or issuing organizations, authors, format, media, structure, sophistication level, etc. Type of literature can be enumerated, e.g. journals, books, pamphlets, reports and so forth. The approach in defining the sources and/or their characteristics starts with an inventory of all possible sources in the defined topics and then continues by narrowing it down to those with highest payoff in terms of criteria for evaluation and quality, and of resources available.

6.3 SELECTION AIDS

In some instances a decision on selection is made upon a direct examination of the very materials to be selected. A candidate book, journal article, pamphlet, film...is inspected by a selector (or committee) and a decision is made. However, more often than not this is not the case. The materials may be impossible to obtain before the selection. Or even when they are obtained outside opinion, review or comparison is sought. Thus, aids or tools are needed which will:

1. guide in selection and
2. help in verification of data needed for acquisition ordering and other processes.

There are a great number of selection aids available in many general and quite a few specialized subjects. There are also a number of lists or bibliographies of selection aids appropriate for given subjects and types of materials. For instance, one of the best discussions and enumerations of such aids for English language materials oriented toward libraries in general can be found in Collection Development by W.A. Katz (6-3). Thus we shall not enumerate here such aids but discuss the types of aids.

Selection aids may be grouped in the following types:

TYPES OF SELECTION AIDS:

1. *Basic bibliographies*
2. *Selected lists (including government and international organization's lists)*
3. *Reviews*
4. *Reference books and directories*
5. *Content tables*

TYPES OF SELECTION AIDS CONTINUED:

6. *Indexing and abstracting sources and services*
7. *SDI (Selective Dissemination of Information) services*
8. *New titles information*
9. *Invisible colleges*

1. Basic bibliographies. There are a number of general bibliographies (such as national bibliographies or annual publication bibliographies), national union catalogs, union lists of serials, lists of in-print and out-of-print books, pamphlet bibliographies, etc. to serve as aids in selection and in verification (spelling of author's name, checking what's in print, where to order, what was published last month or year, what a publisher issues, costs, etc.) These are more important in acquisition than selection.

2. Selected lists. These include both annotated and nonannotated lists of materials pertaining to given types of libraries or information centers (lists of materials recommended for small colleges, public libraries, businesses); evaluated lists in given subjects (civil engineering, international law, schistosomiasis) or given missions or programs (malaria eradication, nutrition, family planning, solar energy); lists of publications by government or international agencies (UNESCO, FAO, INIS, NASA) - also subdivided by subjects; lists of materials including pamphlets for popular use (field manuals, construction, literacy campaigns); etc. These lists are used to gain an idea of what there is relevant to a given topic and/or how it was previously evaluated.

3. Reviews. These pertain to evaluated or critical overviews of particular titles, e.g. particular books, pamphlets, monographs, journals, articles, films. (Note that reviews of titles are not the same as reviews of a subject or topic as treated in Chapter 9). The title reviews can appear in specialized review publications oriented toward the general public or toward libraries;

in scholarly publications for given subjects; in the general news media; in parts of other works in a subject, etc. The use of reviews can be formal (reading of few reviews, comparison, committee selection meetings for commissioned reviews, etc.) or informal (gathering impressions and opinions of others). Reviews themselves should be evaluated (see Section 9.6). They can be biased. Indexes of reviews exist to help find reviews. Use of reviews is important in evaluation.

4. Reference books and directories. These include materials listed in handbooks, directories (of periodicals, manufacturers, organizations), in who's who, biographies and similar reference tools, and could include textbooks. These are used primarily to identify either potential sources of relevant materials or given titles in a subject, or by an organization, person, etc. One drawback of bibliographies, lists, reviews, and directories is that they have by necessity a time lag built in i.e., they generally do not reflect the most current materials.

5. Content tables. These include tables of contents of current issues of journals in given subjects (such as Current Contents, Management Contents, etc.); title and contents pages of books; content descriptions of films or other nonprint materials; etc. The primary use is in getting the idea about the subject of materials and about what is currently available, as are most of the next types of aids described.

6. Indexing and abstracting sources and services. There is scarcely a subject in the world which does not have an indexing or abstracting source available. These may be in print or computer form (or both). Searches through these sources can produce a list of items and/or candidates for selection. However, as other aids, these should also be evaluated as to their coverage, timeliness, etc. For instance, most of the indexing and abstracting sources

do not adequately cover the so called "fugitive" materials (reports, pamphlets), nor do they adequately cover the outputs from developing countries.

7. SDI services. These are items retrieved from an indexing service every so often (e.g. every two months) in response to a stored question ('profile'). Many SDI services exist to which one can subscribe by sending a profile or accepting one of the mass profiles they offer so that one doesn't have to acquire the indexes and do the searching. The problem is in constructing an appropriate profile or selecting the most suitable ones from mass profiles available.

8. New title information. New books, pamphlets, films, journals are usually announced in a number of ways: press releases, publisher catalogs and announcements, book exhibits, mass media articles, advertisements, lists of new publications by organizations, etc. Often these are mass mailed, but one has to get on a mailing list.

These are aids that create the first awareness of a given item or a whole class of materials. Often the associated descriptions can not be taken at face value, thus further evaluations or reviews may be sought.

9. Invisible colleges. This is a nickname for informal communications, information about materials obtained through word-of-mouth, professional contacts and inquiries, correspondence, attendance at meetings, etc. Some of this may be purposefully directed to identification and evaluation of specific materials, some of it may be discovery of relevant materials by serendipity, some of it may be directed toward seeking of examples to imitate or modify. One can cultivate an invisible college for the purpose of selection.

6.4 SELECTION PROCESS

Selection process is a judgment. It is a series of events which result in a decision on acceptance or rejection of given materials for information consolidation; it is the application of the selection policy on the one hand and evaluation criteria on the other with the help of selection aids. It can be more objective or more subjective, more or less critical, more or less formal, more or less constrained by things over which a selector has little control.

The selection process involves:

ELEMENTS IN SELECTION PROCESS:

1. *Selectors: who selects?*
2. *Procedures for judging intrinsic value: how to select from the subject and item point of view?*
3. *Procedures for judging demand and user appropriateness: how to select from user point of view.*

1. Selectors: Who selects? Who is the person or who are the people to make the ultimate judgments? This is one of the perennial problems of all information systems particularly including information consolidation units, wrought with many problems and implications. Involved is a necessity to balance (i) subject expertise (ii) user sensitivity (iii) information expertise (iv) economic considerations and (v) other indirect (but powerful) aspects, such as political considerations. In different systems selectors can be found to be:

* information specialists, librarians

* experts in given subjects

- committees involving either one or both
- committees also involving users.

Information specialists and librarians can be and are among the best selectors because they often combine a knowledge or sensitivity of all of the five aspects enumerated above. However, the more the subject becomes specialized, the more there is a need to use subject experts as selectors. Quite often selection committees turn out to be a proper answer to the problem of balancing all of the five needed aspects; however, one has to realize that traditionally committees are not the most effective to get a thing done. Advice from users can be sought or users can be incorporated as selectors to balance the user viewpoint. Leaving selection to experts and users alone can have drawbacks: this is their side activity and they perform accordingly; their view may be narrow or even subject-biased.

2. Procedures for judging intrinsic values: involved is judgment of the quality, validity, reliability of materials selected. (Criteria for evaluation of information sources are given in Section 7.5) How can this be done? There is, of course, the method of making the judgment directly on the basis of stated or unstated evaluation criteria (discussed in the next chapter). However, there are also methods, a bit more objective, which may aid in such a judgment. These include examination of:

- Reviews and state-of-the-arts of a topic: those reviews (not the same as reviews of titles mentioned in preceeding sections) done by recognized experts in the field, include synthesis, evaluative judgments and citations of usually highly selected literature on a given topic or subject; all of these can be used for selection. Parts of them can be used even for incorporation as information consolidation products. (An example of using such reviews for initial selection and consolidation is given in

Section 7.6).

- Refereeing and peer review: the method involves consensus among peers (experts) in the given area; a refereeing system is present in science in some version or other from the early days to present, thus it has international tradition and well defined ways and means. This method is particularly suitable for selection of scientific materials. (Criteria for peer review are given in Section 7.2 and two examples in Section 7.6).
- Citation indexes: involves an analysis of the amount of citations received by an item, an author, an institution, a journal, etc. With availability of large citation indexes the citation analysis is relatively easy to perform. Various other results can be obtained, such as co-citation patterns or bibliographic couplings. Citation analyses are more suitable for scientific materials, both basic and applied. (See example in Section 7.6).

In many instances, data provided in given sources needs to be examined as its validity and reliability. Again, besides the expert judgment or consensus there are procedures (more costly and cumbersome) which may be involved, such as:

- Comparison: data on the same aspect from different sources is compared for similarities and differences and selection made accordingly.
- Testing: data is tested in a variety of ways or samples are recollected to check their reliability. (Such tests are described in Section 7.4).

3. Procedures for judging demand and user appropriateness: these involve judging the utility of the materials which pass the selection on their own intrinsic value. Results of user studies are matched against the materials. Besides the direct judgment by a selector (or selection committee) some other procedures may include:

- * relevance feedback: examination of materials previously judged relevant by users and subsequent selection of similar items;
- * use analysis: examination of materials previously cited, circulated, read, requested, etc.;
- * demand analysis: finding out about items in demand
- * user tests: talking to users; testing samples of materials, candidates for selection;
- * consultation: seeking experiences from systems and situations similar to own.

Quite often, both of these procedures (for judging intrinsic merit and user appropriateness) are merged into one. Even if they were not, ultimately they have to be merged. Because this is what selection is all about.

7. EVALUATION OF INFORMATION AND OF INFORMATION SOURCES

7.1 OVERVIEW

Evaluation is concerned with determination of the intrinsic merit, validity and reliability, or in short, the quality of information and of information sources which will eventually be consolidated. As such it is crucial in both selection and later in analysis and synthesis. But what is qualitative information? This is a perennial question which is a critical problem in a much broader context than information consolidation and in many human endeavors, particularly including science and technology. There are no easy answers. Unfortunately, there are no formulae or objective measures of information quality -- this is true even in science which itself tries to be as objective as possible. However, there often is a *consensus* as to what is information of higher quality, what is of lesser quality, what is redundant, outdated or superseded information and what is junk, or even worse, what is inaccurate, wrong, or false information. The consensus is built by applying evaluation criteria and tests as yardsticks against which the quality of information is judged. One of the most powerful tests in such a consensus is the test of time, however, over time even consensus may change.

Some of the most elaborate criteria have been developed and applied for a long, long time in science and technology. We shall review them here to provide a guidance for development of similar criteria for judging quality of information and information sources appropriate for information consolidation.

7.2 CRITERIA FOR PEER REVIEW AND REFEREEING

Since the ancient times to the present, science and all of scholarship has been governed as to judgement of meritorious work by a method of peer review and refereeing. So is much of technology. The peers are the judges. This is a method that transcends national, political, cultural and other boundaries, and always did so. The merits of work that resulted in hybrid corn, polio vaccine, theory of relativity, internal combustion engine, etc. are universally accepted first by peers and only then by a broader population. Over time the criteria for peer reviewing and refereeing have been well developed and universally accepted. The refereeing criteria pertains particularly to publications: since scientific work is not completed until published, refereeing is the process of passing a judgement by peers on a manuscript submitted for publication. In many cases criteria used for refereeing are modified or even fully accepted by information specialists and librarians as evaluation criteria for selection.

By the way, the peer review and refereeing process and judgement should not be confused with the process and judgements of funders and administrators of scientific and technical work. More often than not some of the criteria differ. Thus the criteria of funders are reviewed separately in the next section.

Here are the peer review and refereeing criteria as used in science and technology classified into those that pertain to more objective and more subjective judgements (as mentioned, there are no fully objective criteria and judgements):

CRITERIA IN SCIENCE AND TECHNOLOGY FOR PEER REVIEW AND REFEREEING:

A. More objective criteria:

1. Underlying problems, facts, assumptions, parameters of thought: how well examined, organized, stated or recognized? Are assumptions warranted?
2. Hypothesis; question, concepts: are they clear and do they embody the problems, facts, parameters?
3. Methods: appropriate, competent; authoritative use of resources.
4. Analysis: appropriate; follows from facts collected or observed; relates to assumptions, hypothesis, question.
5. Interpretation: logical, common sense; strong; follows from analysis.
6. Validity: does the work stick to a defined problem, parameters, questions, hypothesis? Does it do what it claims to do?
7. Reliability: accuracy; reflection of reality, degree and appropriateness of controls to eliminate biased results. Can the same results be obtained in repeated observations? Are there conflicting results?
8. Awareness: demonstration of knowledge of previous and related works; integration into larger body of work, knowledge.

B. More subjective criteria:

1. Problem significance: to what extent is the problem hypothesis, question investigated significant or trivial?

CRITERIA IN SCIENCE AND TECHNOLOGY FOR PEER REVIEW AND REFEREEING CONT'D.:

2. Solution significance: to what extent is the solution important or trivial? (e.g. the problem can be significant, but the solution trivial).
3. Originality: to what extent is the work unique startling, unusual, shedding new light, enlightening?
4. Author, institution: reputation, quality of previous work, honesty, credibility, competence.
5. Value: for future work (as stimulation, encouragement, guide); for education and training; for practice; for given audience. Future impact.
6. Reporting style: readability; clarity; jargon; organization; logic of presentation; tone; color; degree of sophistication required to follow.
7. Publication: (if published, judgement on source where work is reported): reputation, refereeing extent, quality of previous works reported, honesty, authority, credibility.

Science and technology is very, very selective in its own 'natural' way. For instance (7-6, 7-8, 7-9, 7-12, 7-19, 7-20):

- * Close to 50 percent of the scientific papers published are never cited even once.
- * Only a small proportion of the literature is cited out of proportion (about 5-10%), constituting a research front in each subject topic.

- Most significant work in science is produced by a minority of authors, (so called scientific 'elite').
- A small proportion of authors publish a large bulk of the literature in a subject.
- A large proportion of total articles in a subject is published in a very small percentage of journals among which it is distributed.
- Furthermore, as literature is ranked and increases in quality there is a profound reciprocal reduction in the number of papers, authors and journals.

In other words, selectivity and evaluation in science work in such a way. that the majority of good, evaluative articles is found in a very small proportion of journals and is written by a small proportion of authors. A quality filtering is at work. Because of this a small personal or institutional library or information center, if well selected, is valuable far above its proportion to the total literature and a small institute in any place of the world can be a major part of a large subject.

In view of such demonstrated and well documented selectivity these enumerated criteria assume a very important role.

7.3 CRITERIA FOR FUNDING OF RESEARCH[1]

The funders, administrators, overseers of science and technology are often by necessity concerned with additional and even differing criteria than peers in passing judgement in relation to questions such as: what topic to support? Which projects to fund? How much to fund? What to push for? etc. These criteria are also useful (and may be even more so) in setting the criteria for selection of information or information sources for consolidation.

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[1] Research here is interpreted very broadly to include development and applied works and projects.

In general, the following four classes or criteria are employed by funders and administrators in decisions on which particular research proposal or work to support, fund, or give priority:

CRITERIA FOR FUNDING OR SUPPORT OF RESEARCH PROJECTS:

A. Criteria related to competent performance of research - the technical adequacy of performers and their institutional base:
   1. The researchers' training, past performance record; estimated potential for future accomplishment.
   2. The researchers' awareness of previous and alternative approaches to problem.
   3. Probable adequacy of available technical support, instrumentation, etc.

B. Criteria related to internal structure of larger area (field) in which proposal is made or work conducted:
   1. Probability that research will lead to important discoveries or valid generalizations within its field.
   2. Most favorably: the probability of research extending to other fields.

CRITERIA FOR FUNDING OR SUPPORT OF RESEARCH PROJECTS CONT'D.:

3. Probability that research will lead to significant improvements or innovations in the methods of work and research -- again, with possible extension to other fields.

C. Criteria relating to utility or relevance:

1. Probability that research can serve as the basis for new invention, improved technology and practical applications.
2. Probable contribution of research to technology assessment; to estimating direct or indirect, intended or unintended effects of existing or proposed technologies and technological applications.
3. Identification of immediate pragmatic context and users of anticipated research results.

D. Criteria relating to future, plans, and potential of a country or region:

1. Anticipated effect upon country's or regional activities and plans, and upon the structure of the field in the country.
2. Probability that research will lead to wider diffusion not only of technical results, but of standards of workmanship, productivity, tradition in the field, etc.
3. Probable influence of the research upon capabilities, interests, careers of participating

researchers, including students, technicians, trainees; influence on creation of know-how and technical competencies.

As the choices of works and projects proliferate, while the funding and other resources keep steady or even diminish, the importance of such criteria becomes greater and greater. In instances where consolidated information is aimed at helping decisions on funding and support for research and development by legislative bodies, councils, ministries, industries, etc., clearly these criteria should play a crucial role in selection and evaluation of information appropriate for consolidation.

7.4 DATA EVALUATION

Scientific, technical, business and related literature contains many valuable data covering a wide range of diverse fields. Many activities in these areas are about data per se. Unfortunately, the literature also contains many data that have erroneous values, that are only marginally correct or even worse, that are plainly false.

Even in the area of "hard" scientific and technical data, (e.g. even on measures of physical phenomena such as thermal conductivity of 99.5 percent pure alumimun oxide) considerable discord exist in the values reported. Owing to difficulties encountered in the accurate measurement of the properties of materials and processes and in the adequate characterization of test specimens and conditions, the data recorded in the scientific and technical literature are often conflicting, widely diverging and subject to a large degree of uncertainty. Indiscriminate use of literature data for engineering and design calculations, for health and other applications, without knowing their reliability is dangerous and may cause inefficiency of products and other failures, which at times can be disastrous. Consequently, it is recommended over and over again that only critically evaluated data should ever be used (7-10). *CRITICAL DATA is that which may be used with confidence in planning experiments and projects, reducing results and interpreting phenomena.*

Errors for hard data can be in order of magnitude, as many studies by national and international bureaus of standards and other institutions have documented. As a result many efforts are made to cope with the problem. For instance, International Council of Scientific Unions (ICSU) has instituted a Committee on Data for Science and Technology (CODATA); this is an international forum on data evaluation; it produces state- of-the art in many countries of the world (see CODATA Bulletin, published since 1969); and it has instituted wide efforts for evaluation of data and production of critical tables. Information centers have sprung up that are concerned with validity and reliability of scientific and technical data, such as the Center for Information and Numerical Data Analysis and Synthesis (CINDAS), Purdue University, which among others collects and compares data and draws recommended curves(which also include disparate values that were reported in the literature).

In the areas of the 'softer' data the situation is obviously much worse. Thus, experiences have shown that particular care has to be exercised in acceptance of such data and that probabilities of error have to be always considered.

As a result of this situation in relation to both, 'hard' and 'soft' data efforts are expanded to develop methods for data evaluation, and in data production and processing methods for error reduction and quality control (7-18). Here are some of the more common methods or tests used in data evaluation (clearly, the selection of a given test depends on the nature and properties of data):

METHODS FOR DATA EVALUATION:

1. Comparison: obtaining data on the same phenomenom or item from a number of different sources and comparing for discrepancies; resolution and reconciliation of disagreements in conflicting data.
2. Correlation: establishing, controlling parameters and correlating data on various parameters.
3. Deterministic tests: (for the data on the same item in one record) establishing 'if ... then' conditions and/or correlations between data for different variables in a record and checking if they exist.
4. Probabilistic tests - parametric data (assuming underlying normal distribution):
    - test of confirmation of a normal distribution or normal rejection
    - gross error control method - screening based on distribution of ratios involving extreme values
    - comparison of data to historical experiences (where available) -- e.g. historically obtained means and standard deviations.

5. Probabilistic tests - nonparametric data (normality cannot be assumed):
   - rough intuitive sort - comparison with historical experience
   - test of randomness: if random assumptions
   - test of inqualities - i.e. test of proportion of values that are more than some calcuated constant from the mean

METHODS FOR DATA EVALUATION CONT'D.:

6. Classification of patterns (in types of variability and in testing for unusual values):
   - curve fitting with theoretical or empirical equations
   - curve classification tests - patterns of values variables can take.
7. Theoretical predictions: comparison of data with theoretical prediction or with results derived from theoretical relationships or from generalized empirical correlations.
8. Error score: establishing a priori, a failure or error score for every item in a record (error rate, likelihood of error) and checking against it.
9. Informally: applying rules of common sense and experience to assess the correctness of data.

In data production and processing quality of data can be checked and improved by judicious application of quality and process control. One method for this consists of establishing a sampling routine to continuously monitor the quality of various aspects of data handling process. Another method is to establish acceptance sampling i.e. rules for deciding if a particular work lot is or is not of acceptable quality.

A true data evaluation, as discussed here is much more than what often passes as "data evaluation", such as checking if right formulae were used, if correct references were included, if the form of references or reporting was right, etc. It is also more than peer refereeing and passing of peer judgement. It involves test and confirmation of the very validity and reliability of data reported - first, foremost and exclusively.

However, the big question is the cost, effectiveness and benefits of data evaluation activities. It is a costly and complex effort. Is it worth it? There are situations where extensive data evaluations may indeed be necessary and cost-effective (e.g. in terms of wrong decisions which may be made on the basis of wrong data) and other situations where the extensive evaluation produces only marginal benefits. Nevertheless, when data is involved in information consolidation some effort has to be expanded on data evaluation.

7.5 EVALUATION OF INFORMATION SOURCES

For a long time information specialists and librarians have been concerned with criteria for evaluation of information sources, ... of print and nonprint ones ... of monographs and periodicals ... of open and fugitive literature ... of primary, secondary, tertiary sources ... of books and textbooks, pamphlets and manuals ... of records, films, tapes, slides ...

of literature in science as well as in fine arts, in business and in industry, in contemporary literature and classics ... and so forth. Thus, over the years the criteria have become well developed; their application in selection constitutes a high and quite unique professional art by information specialists and librarians. Specific libraries and information centers have developed by necessity specific criteria to serve their needs. Many of these criteria are applicable for adaptation in evaluation of information sources for consolidation.

Here are the ten major criteria most often used in evaluation of information sources:

CRITERIA
FOR
EVALUATION
OF
INFORMATION
SOURCES:

1. *__Why__: Purpose and scope. Viewpoint.*
2. *__For Whom__: Intended audience. Needs intended to satisfy.*
3. *__What__: Subject matter. Level of difficulty. Exhaustivity. Extent of supportive material. Significance.*
4. *__By Whom__: Authority, reputation, honesty, credibility of author(s), institution where work performed or issuing organization (if no individual author). In audiovisual materials: performer, photographer, etc.*
5. *__Where__: Authority, reputation, honesty, credibility, of publisher. In journals: extent of refereeing. In audiovisuals and films: director, producer, etc.*
6. *__When__: Timeliness. Up-to-dateness of supporting materials. Edition: if succeeding editions, extent of update and revision.*

CRITERIA
FOR
EVALUATION OF
INFORMATION
SOURCES
CONT'D.:

7. *How: Treatment; readability; style; organization of presentation; clarity; extent of jargon; quality of illustrations and graphics*
8. *In what way: Physical aspects: format, lay-out, print, legibility, binding ... For audiovisuals: format, lay-out, visual or audio quality, readability of captions, color, synchronization, etc.*
9. *How much: Price. Possibly: cost-benefits.*
10. *In comparison to: Other similar sources in the subject. Other sources in collection.*

The work or data itself reported in information sources may be subjected to further evaluation by criteria previously enumerated. And ultimately,the sources will have to be related to users.

7.6 USER EVALUATION OF INFORMATION SERVICES

In this chapter the stress is on criteria for evaluation of information (including data) and information sources. To get a rounded picture of evaluation as a whole it is appropriate to diverge for a moment from the main topic of the chapter and discuss evaluation from the point-of-view of users of information services and products.

A great many studies have been performed on what the users value in the services and products of information systems in general and information analysis centers in particular. (e.g. 7-13, 7-14). Out of these studies came attempts to define a set of general criteria by which users tend to evaluate and judge information services and their products. Here are five general classes of criteria or dimensions which are found to be most often applied by users:

USERS' CRITERIA IN EVALUATING AN INFORMATION SERVICE:

1. *Information (or data) quality, including*
   - * *Precision and accuracy of information.*
   - * *Credibility of the source(s).*
   - * *Recency of information.*
2. *Scope, including:*
   - * *Completeness of information.*
   - * *Comprehensiveness of subject or topic coverage.*
3. *Appropriateness, including:*
   - * *Fitting with needs, requirements, request; degree to which information is personalized as requested.*
   - * *Degree of reaching or exceeding information overload or tolerance for processing information.*
   - * *Fitting with own capabilities: language, sophistication, level.*
   - * *Degree of opinions, extraneous, irrelevant information.*
4. *Haggle and hassle factors, including:*
   - * *Time lag in receiving information.*
   - * *Ease of usage of received information (e.g. format; additional steps required).*
   - * *Ease of access to the service (e.g. minimum of red tape and paperwork, procedural delays, distances, channels).*

USERS'
CRITIERIA
IN
EVALUATING
AN INFORMATION
SERVICE CONT'D.

* *Efforts required to get a response; support received in access and use.*

5. *Costs, including:*

* *Direct costs of obtaining service.*
* *Indirect cost in accessing and using the service and in post-processing of information.*

In different situations different priorities may be assigned to each of these dimensions. In addition other specific criteria may be used by different users in the same situation and by the same user at different times or situations. Thus, these criteria tend to be more fluid than the other discussed in this chapter.

7.7 PROBLEMS IN EVALUATION

Who should be the evaluators? How should they go about doing the evaluation? These are the big questions in evaluation. The major problem in any and all evaluations are not the criteria, but their application. Explicit criteria improves judgement, but no criteria can ensure a complete consistency and agreement even among subject experts.

Some degree of subject expertise is necessary for a person to be an evaluator. The more specialized the subject and the clientele the greater the expertise required. However, studies show that even in rather narrow scientific specialties where high degree of expertise is present among the peers, scientists (experts) tend to disagree in their evaluations; the judgements are not necessarily in agreement, particularly in the "gray" area of medium value, nor are the judgements always consistent (7-20, 7-23). The 'softer' the field or data the more disagreement and inconsistency can be expected. Getting one single expert in a field to evaluate a piece of information or an information source may not necessarily be an assuring solution. This fallibility of evaluation should be realized and not ignored.

The only way to resolve this problem of evaluation is to search for repeated evaluations and for some sort of consensus. The first two examples presented in the next section illustrate this approach.

Some information consolidation can be achieved without using artifacts (e.g. printed documents). The information source for consolidation can be an expert, or rather the knowledge he or she has on the subject. The consolidated product is derived directly from that personal knowledge. The problem, of course, is evaluation of that personal information source. It is a most difficult and even more a delicate proposition. The standard academic ways of evaluating students' knowledge are out of the question. The only way to evaluate an expert's knowledge of a topic is to do it indirectly. And this can be done only if the expert has published something on the topic. In that case the publication is evaluated on the basis of the criteria discussed previously in the sections on peer review and on evaluation of information sources. But, the knowledge of any expert should be evaluated somehow. For it could be wrong, outdated, biased. It was found as such many times in many places in the past. Again, as the succeeding examples show, one way out is to use knowledge of a number of experts and not only of a single one.

The ideal situation is to have evaluators that are both: experts in a subject and experts in information services (including users). The biggest and most often occurring problem is when the evaluators are experts in only one of these. Expertise in a subject does not at all assure knowledge of communication in that subject and even less of the needs of information users and ways of information services. But somehow it happens so often that a subject expert wrongly assumes himself or herself to also be an information or library "expert", and often their basis is nothing more than that they read or have used a library. Conversely, expertise in information work does not qualify one to be an evaluator in every subject. But, somehow many information experts, on the basis of years of experience, assume themselves to be competent "evaluators" in any subject. Needless to say, both positions are fallacious and even dangerous. Unfortunately, the ideal situation mentioned above is rarely achieved. Thus, a variety of compromises have to be worked out. The first and essential step in those compromises is to push for recognition that nobody is an "expert" in everything. Knowledge in one area, no matter how great, does not qualify one to be an expert in another area.

7.8 THREE EXAMPLES

7.8.1 LITERATURE EVALUATION

The first example is from the National Clearinghouse for Alcohol Information (NCAL), of the U.S. National Institute on Alcohol Abuse and Alcoholism. One of their services is to provide a quality evaluation rating for the documents announced by the Clearinghouse (7-5). They have a Quality Evaluation of Literature System (QELS) which is designed to select and discriminate among literature in the field on the basis of quality criteria developed by alcoholism field professionals and to announce the resulting comparative ratings to literature users. In this way, QELS aids literature users in determining those documents of highest potential value to them. In addition, the Clearinghouse announces all of the literature collected and provides various services, QELS is only one of them. It is a type of an information consolidation product and service. It uses peer refereeing as its basic method.

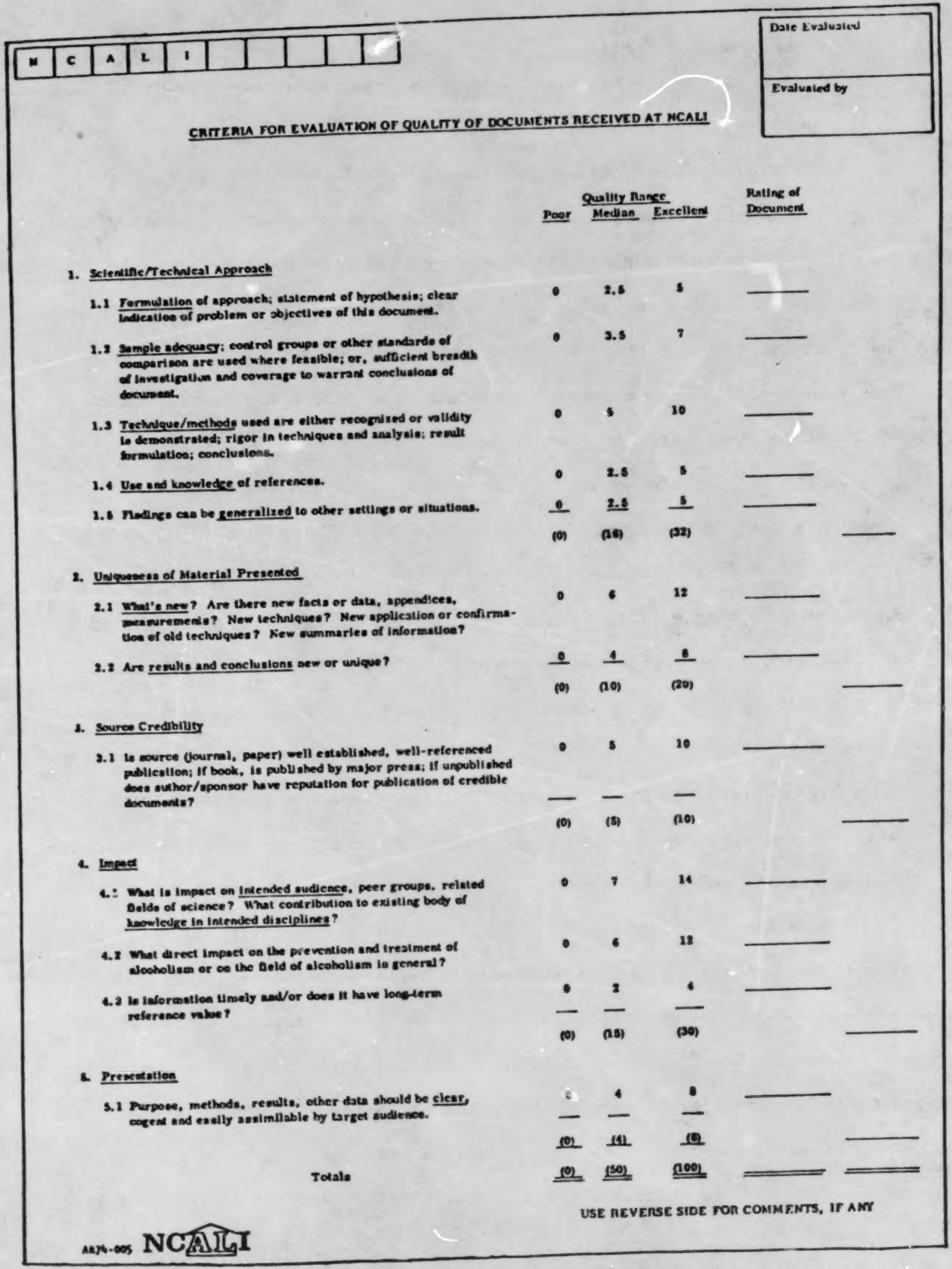
The mechanism of the system starts with the initial document ratings by a group of highly regarded professionals who are peers of the authors. In other words, each document is evaluated by a panel, but panel members work independently of each other. Then these 'raw' ratings are converted into a standardized score for comparability. The scores are announced through the information services of the Clearinghouse. The users are encouraged to provide their own feedback ratings which are then factored into a document score during a regular cycle of additional review and update.

The rating of the criteria is shown in Figure 7-1. Numerical ratings assigned range from 0-100. The numerical rating for each document is then converted to a so called stanine score through the use of a general statistical rating standardization technique that provides a basis for comparison of raw ratings. This provides for consistency even though raw scores for a document may vary from one evaluator to another. This service has received a very high acceptance by users.

(For more information contact: National Clearinghouse for Alcohol Information, P.O. Box 2345, Rockeville, Maryland, 20852, USA).

7.8.2 SELECTION FOR EVALUATION SYNTHESIS

The second example is from the Hepatitis Knowledge Base (HKB) of the



N C A L I

Date Evaluated

Evaluated by

CRITERIA FOR EVALUATION OF QUALITY OF DOCUMENTS RECEIVED AT NCALI

	Quality Range Poor	 Median	 Excellent	Rating of Document	
1. Scientific/Technical Approach					
1.1 Formulation of approach; statement of hypothesis; clear indication of problem or objectives of this document.	0	2.5	5		
1.2 Sample adequacy; control groups or other standards of comparison are used where feasible; or, sufficient breadth of investigation and coverage to warrant conclusions of document.	0	3.5	7		
1.3 Technique/methods used are either recognized or validity is demonstrated; rigor in techniques and analysis; result formulation; conclusions.	0	5	10		
1.4 Use and knowledge of references.	0	2.5	5		
1.5 Findings can be generalized to other settings or situations.	0	2.5	5		
	(0)	(16)	(32)		
2. Uniqueness of Material Presented					
2.1 What's new? Are there new facts or data, appendices, measurements? New techniques? New application or confirmation of old techniques? New summaries of information?	0	6	12		
2.2 Are results and conclusions new or unique?	0	4	8		
	(0)	(10)	(20)		
3. Source Credibility					
3.1 Is source (journal, paper) well established, well-referenced publication; if book, is published by major press; if unpublished does author/sponsor have reputation for publication of credible documents?	0	5	10		
	(0)	(5)	(10)		
4. Impact					
4.1 What is impact on intended audience, peer groups, related fields of science? What contribution to existing body of knowledge in intended disciplines?	0	7	14		
4.2 What direct impact on the prevention and treatment of alcoholism or on the field of alcoholism in general?	0	6	12		
4.3 Is information timely and/or does it have long-term reference value?	0	2	4		
	(0)	(15)	(30)		
5. Presentation					
5.1 Purpose, methods, results, other data should be clear, cogent and easily assimilable by target audience.	0	4	8		
	(0)	(4)	(8)		
Totals	(0)	(50)	(100)		

USE REVERSE SIDE FOR COMMENTS, IF ANY

AA74-005 NCALI

FIGURE 7-1: FORM FOR LITERATURE EVALUATION USED IN NCALI.

U.S. National Library of Medicine (7-1). This is a prototype Knowledge Base in the Knowledge Base Program, a larger undertaking whose goal is to contribute to more effective access and use of biomedical information in solving the daily problems of diagnosis, prognosis, and treatment of illness. Knowledge Base is an integrated medical information system in which current biomedical literature in specialized areas is identified, selected, reviewed, condensed, and synthesized by experts. Based on experiences with the Hepatitis Knowledge Base (under development since 1976) two other subject areas, peptic ulcer and human genetics, are being developed.

As the work on HKB began the difficulty of the problem was quickly revealed after a MEDLINE search retrieved 16,000 publications on viral hepatitis in the English language alone for the past 10 years. That so much was published in a single field of medicine led to the simple conclusion that a complete literature review was impossible. Rather than a full literature review, initial information sources were limited to recent review articles published by experts in the field. Review articles were chosen because they are a high-quality, analytical, organized, and compacted synthesis of information in a given area. A degree of evaluation is already built in; also the highest quality and most relevant literature is cited.

Approximately 40 review articles, published by hepatitis experts, were selected to construct the initial draft of HKB. The contents of reviews were studied, topics selected, arranged by topic headings and subheadings and "cut and pasted" into a single body of information and put in a computer to facilitate retrieval. The organization of topics was by a highly structured hierarchial arrangement. The topic headings serve as a table of contents and consist of a detailed listing of subject matter aspects one expects in a large, thorough textbook on a given medical subject. For each topic heading or subheading there is an accompanying statement which is a synthesis of the state of knowledge on that heading. Each statement is supported by "data-elements" which are paragraphs derived from the review articles. The content of these data-element paragraphs was only minimally edited. Often data-elements taken from different reviews contain conflicting data and views. It is the purpose of the whole statement under a heading to reconcile such differences when possible or to leave them unresolved when appropriate -- that is, to synthesize the state of knowledge as it can best be understood. Citations to primary literature in a review are included with given statements as supporting evidence.

Figure 7-2 shows a heading with its three subheadings from the table of contents of HKB. Figure 7-3 shows what is provided for in one of these subheadings (52H), namely, the synthesized statement about the heading, supporting data - element paragraphs and literature citations. The synthesis is a brief, compact, telegraphic, hard statement of the major known points. It is followed by several supporting paragraphs from the review articles and a selected list of citations. Each heading, statement, data element and citation is identified by a paragraph number. These allow for further displays by computer, that is for an interactive access and flexibility in exploring the knowledge base; for instance, by typing the unique paragraph number (or placing a cursor on the number displayed on CRT) any subject of interest can be immediately displayed. When in printed form these paragraph numbers allow for cross-reference retrieval and access.

The methods for arriving at the contents and further updating of HKB is evaluation and consensus by experts. The initial draft of HKB derived

- 41H Morphology, antigenic structure, and immunology of the hepatitis A virus (HAV)
  - 43H Morphology of the hepatitis A antigen (HA Ag)
  - 52H The unique antigenic identity of the hepatitis A virus (HAV)
  - 87H Distinction between the hepatitis A virus antigen (HA Ag) and other antigens and agents

FIGURE 7-2: SAMPLE EXCERPT OF THE TABLE OF CONTENTS OF HEADINGS AND SUBHEADINGS IN HEPATITIS KNOWLEDGE BASE.

53 The unique antigenic identity of the hepatitis A virus (HAV) has been established by a large series of intertwined laboratory, volunteer, and clinical studies of HAV infections in marmosets, chimpanzees, and man. Study of the induced disease, the virus-like particles isolated, the antigenic responses, and their interrelationships establishes the HA Ag as the unique infectious hepatitis A virus; the HAV is morphologically and antigenically identical with the MS-1 strain, the CR-326, and the particles of Cross, Feinstone, Maynard, Hilleman, Deinhardt, and Zuckerman.

> 54 That some species of marmosets are susceptible to HAV, by either parenteral or oral inoculation, was confirmed by a number of laboratories (ref. 232, 237, 234). These studies have allowed isolation and morphologic and antigenic characterization of the hepatitis A antigen particle (HA Ag).
>
> 55 In 1965 hepatitis type A was transmitted to tamarins, small South American monkeys (ref. 236). The relationship of this hepatitis in tamarins to human hepatitis A was firmly established by coded studies (ref. 518, 519) and was later confirmed by others (ref. 491, 700, 736, 932).
>
> 56 Eleven of twelve theoretically or proven positive type A hepatitis specimens induced hepatitis in marmosets; whereas four hepatitis B specimens, one infectious mononucleosis serum, and six normal control sera induced no biochemical or histological liver changes in inoculated animals (ref. 232).
>
> 57 Sixty-five of eighty-nine animals inoculated under code with hepatitis A specimens developed hepatitis; in contrast none of sixty-five animals inoculated with control sera or plasma showed any sign of disease nor did uninoculated control groups. Marmosets infected from patients with MS-1 strain of hepatitis A (ref. 637) produced feces containing 27 nm cubic virus-like particles (by immuno electron microscopy (ref. 313, 315, 935) and contained the fecal antigen of HAV (ref. 321, 209, 208). All specimens containing the virus-like particles or containing the fecal antigen induced hepatitis in marmosets. However, some specimens with neither the virus-like particles nor the fecal antigen induced disease in the animals indicating that infectivity in marmosets is the most sensitive of test systems (ref. 232).

231 Deinhardt, F, Peterson, D, Cross, G, et al.: Hepatitis in marmosets. Am J Med Sci, 270 (1): 73-80, 1975.

236 Deinhardt, F: Hepatitis in subhuman primates and the hazards to man. P. 55. In: Balner, H, and Beveridge, WIB, ed. Infections and immunosuppression in subhuman primates. Munksgaard, 1970. QW 504 I62i 1969.

253 Deinhardt, F, Wolfe, L, Peterson, D, et al.: The mythology of various hepatitis A virus isolates. In: Hennesen, W, Perkins, FT, and Ragamey, KH, ed. Proceedings of the International Symposium on Viral Hepatitis, organized by the International Association of Biological Standardization. Karger, 1975. W3 DE615E 1974 v. 30.

FIGURE 7-3: SAMPLE EXCERPT FROM HEPATITIS KNOWLEDGE BASE LISTED UNDER A SUBHEADING 52H THE UNIQUE ANTIGENIC IDENTITY OF THE HEPATITIS A VIRUS (HAV)

from the 40 reviews was considered as a single person's view of what is known about viral hepatitis three years previously. Consensus on contents was then sought from 10 experts in the field. Each expert was requested to read and become generally familiar with the entire draft knowledge base provided in hard copy, and to perform a thorough, detailed review of one-tenth of the material. They were asked to identify weaknesses, inaccuracies, and missing information that needed to be remedied; consider and suggest changes in overall organization of the data base; suggest changes in individual data elements (rewriting for improved fidelity or clarity, elimination because of unimportance or redundancy, shortening or lengthening, identifying known but missing information to be included from the source documents or from any other sources, and other changes for whatever other reasons); and to consider and suggest changes in the headings and heading statements. Greatest emphasis was placed on reaching a consensus on the state of knowledge for each heading. This is because synthesis statements are likely to be the most important pathway for information transfer. The consensus may have ranged from unanimity to support of two or more mutually exclusive views, or to the belief that necessary information was lacking. The statements simply describe whatever the views are. No attempt was made to force convergence toward a single consensus when supporting data does not warrant only one view. The written consensus reflects the content of the material from published source documents; personal knowledge by the experts of unpublished information was excluded from consideration so as to avoid the additional problems inherent to the assumption of a function now exerted by the editorial board of scholarly journals.

Decisions as to inclusion, exclusion, and/or modification of content were determined by vote of the expert group. The chairman had final authority in determining when consensus had been reached; generally, when two or more negative votes occurred, the paragraph under consideration was modified and/or reconsidered by the entire group. The consensus-reaching process was facilitated by the use of computer conferencing. Had the process been done in isolation, the result would have been a consensus on what had been known about viral hepatitis sometime previously; in fact, the process was meshed with the updating process described below.

The next problem was methodology for updating; after all as knowledge changes a knowledge base needs to be kept updated. The Hepatitis Knowledge Base required both an initial and continuing updating process. The initial update was needed because it was recognized that by the use of review articles the initial draft would be unavoidably about three years out of date. The plan was to have the group of hepatitis experts update the content of the initial draft with materials selected from recently published scholarly journal articles. Even that was proven wholly impractical because a search of MEDLINE covering the most recent two year seven month period retrieved some 5700 articles. Thus, a unique combination of known quality-filtering techniques were used. This included analysis of citation patterns of articles, authors, and journals in the initial draft of HKB and a journal citation analysis from Journal Citation Reports. These methods identified journals in which the highest quality literature on viral hepatitis appears. Thus, a small and manageable set of journals was identified from which to select. As expected the mass of good articles was found in a very small proportion of journals of quality. Forty-seven percent of all citations (in initial draft reviews) were to articles in five journals and approximately 80% in 18. It seemed reasonable to move from this a posteriori identification of quality journals to an a priori assumption that those journals would remain so in the immediate future. It was also assumed that by selections for updating from the 18 leading journals, the articles will contain citations to other important sources. Important new findings on hepatitis cannot remain long outside the ken of the authors who publish in these journals. Furthermore, eclectic users will bring in those quality items possibly missed.

This quality filtering process made the updating manageable. By focusing on articles appearing in 18 leading journals only 674 articles instead of 5700 needed to be reviewed. When divided among 10 experts each had about 67 articles, averaging four pages each. Articles were assigned for review without matching contents with special interests of experts. The experts were also encouraged to include in their consideration any other publication from any other source which they knew about individually.

Each expert reviewed the assigned articles to select information new, relevant and important enough to propose adding to HKB. The experts wrote a synthesizing paragraph statement, including the relevant citations. These paragraphs were analogous to data-element paragraphs in HKB. Changes in associated headings could also be proposed. The experts' proposed new data-elements, or suggested revisions of synthesizing statements which should be integrated into an updated version of HKB by a text composer; and the updated draft distributed in hard copy to the 10 experts for further consideration, modification, or ratification -- that is, for consensus development. As consensus was reached among experts modifications were entered into HKB to stay. Iterations of this process continued until the knowledge base was completely updated. After that, distribution of three to four newly published articles monthly to each of the 10 experts allows maintenance of the information in the HKB only two or three months behind what is published in the general literature. The menu of journals in selection of articles is not meant to be fixed; analysis of the most recent writings and citation patterns tries to detect any shifts in quality journals.

To assemble, repeatedly update, and reach consensus on the content of HKB has required extensive, continuing, reiterative communications between the 10 experts and the staff of HKB. Communication was accomplished through computer conferencing, which proved to be an effective channel of communication among a number of people for this particular purpose.

The Hepatitis Knowledge Base is something betweeen a synthesizing book (or textbook) and a bibliographic search. At one extreme is the well-written, highly polished, intellectually sound, integrated, non-redundant single authored book or review article. At the other extreme is a list or printout in response to a request for a bibliographic search which enumerates citations, sometimes with abstracts, in which can be found a wide range of writing styles, quality of work ranging from superb to bad or trifling and much redundancy. The HKB has some attributes of both. It is a highly organized sound body of information, but includes widely varying source materials from many authors, differences in style and depth of detail and deliberate redundancy when information is important to more than one heading. It is to be used mainly as a source of needed information, but it does not read as a book. The process is one of synthesis of existing knowledge from peer reviewed publications. It is not a method for generating new knowledge or for first recording of new knowledge. It is not competitive with books and journals.

The inclusion of conflicting views and data assures that it will not become some official version of "truth". Rotation of membership in the expert group and inclusion of members with divergent interests and knowledge is done to minimize stultifying effects. Requests for comments from users are made to evaluate the process and coverage. An open process is intended.

This example pertains not only in particular to the methods for evaluation, but also to information analysis and synthesis treated in the next chapter.

After more experience is gained with the contents of HKB, the plans are calling for a number of derivative products and services. These include: hard copy or microform publications of all or a selected portion of HKB; short versions consisting only of synthesis statements for use by medical students; programmed access to selected questions and answers via computer terminal or by telephone to access audiotapes; educational modules packaged with audiovisuals for selected user groups, etc.

(For more information contact: Knowledge Base Program, National Library of Medicine, Lister Hill National Center for Biomedical Communication, 8600 Rockville Pike, Bethesda, Maryland, 20209, USA).

7.8.3 DATA EVALUATION

The third example is from the Center for Information and Numerical Data Analysis and Synthesis (CINDAS) at Purdue University (7-4, 7-10). The Center identifies from the literature, compiles, critically evaluates, analyzes and synthesizes numerical data on the physical properties of materials with the aim of generating recommended reference data for world wide dissemination. This data is useful for scientists, engineers and technicians (e.g. in design and construction of hardware, equipment, buildings, in experiment). CINDAS covers fourteen thermophysical properties and twenty-two electronic, magnetic, and optical properties for nearly all materials in all physical states and at all temperatures.

The process resulting in recommended reference data for a material is carried out in three stages:

1. In the first or documentation stage,the world literature is systematically and comprehensively searched, the original documents of interest uncovered and procured. Documents are reviewed, codified, cross-checked and classified (indexed) by data properties and materials.
2. In the second stage,the documents are studied, data is extracted, structured, organized, converted to uniform units, and homogeneously plotted and tabulated in the form of "Tables of Original Data" which present all the available experimental data and information on a given material and property.
3. In the third stage,internally consistent tables of critical evaluated "best data" are prepared and "Tables of Recommended Reference Values" are generated. Subsequently, the organized data is again critically evaluated. These Tables include all values found and show divergence in results.

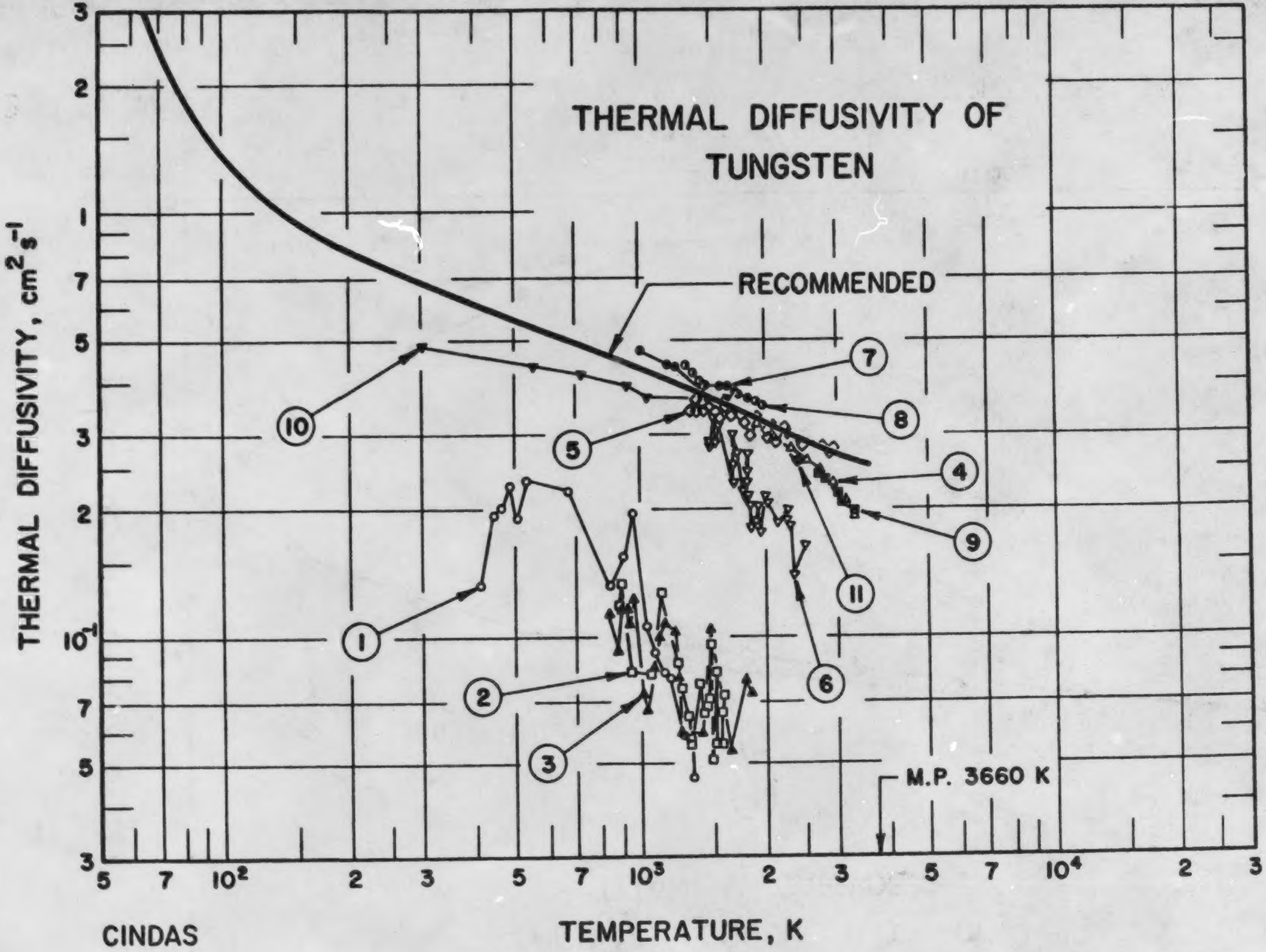
The detailed procedures which CINDAS follows in data complilation as well as in data analysis and synthesis are not necessarily a matter of established routines and do vary from property to property and from one group of materials to another. There are certain principles which must be followed, however, irrespective of the type of data or materials involved. For example: (a) the data should be extracted directly from their original sources to ensure freedom from errors of transcription; (b) the characterization and physical and chemical conditions of the test specimen should be specified as clearly as possible so as to fully identify the materials tested; (c) especially for solids, the source of the material, method of fabrication, thermal history, heat, mechanical, irradiative, and other treatments of the specimen and the measuring method and conditions should be noted; (d) if a comparative measurement method is used, the material used as comparative standard and its property values should be cited; (e) the accuracy and precision of the data reported should be separately noted; (f) the complete reference to the original work should always be cited with the data; etc. Whenever some of the above criteria cannot be satisfied because of absence of necessary information in the original work, an attempt is made to contact the author, if possible. In the cases where data cannot be adequately evaluated by CINDAS due to lack of required information, such data were appropriately "flagged".

Considering the thermal conductivity data for example, in the critical evaluation of the validity and reliability of a particular set of experimental data, the temperature dependence of the data is examined and any unusual dependence or anomaly is carefully investigated. The experimental technique is reviewed to see whether the actual boundary conditions in the measurement agreed with those assumed in the theoretical model to define the property. Since the primary factor contributing to unreliable and erroneous experimental results is the systematic error in measurement, experimental data can be judged to be reliable if all sources of systematic error have been minimized or eliminated and accounted for. This is examined if it was considered by the author. Besides evaluating and analyzing individual data sets, correlation of data in terms of various controlling parameters is also employed as a valuable technique in analyses. Several properties of the same material can be cross-correlated.

It is important to note that irrespective of how much experimental data are available, reliable information exists only after the experimental data has been critically evaluated and recommended values generated. Figure 7-4 serves to illustrate this point. It presents the experimental data and the recommended values on the thermal conductivity of titanium carbide from six sources and shows that the lower two sets of experimental data are utterly erroneous, being about five times too low at 800 K and ten times too low at 1350 K. Yet the lower two sets of data were published by an internationally well-known scientist and were obtained by using two completely different experimental methods for measurement. Titanium carbide has been extensively used to make machine tools. If machine tool designers blindly use the lower data for design without knowing that the data are erroneous, one can imagine the serious consequence.

Figure 7-5 presents the experimental data and the recommended values on the thermal conductivity of tungsten and shows that most of the experimental data are erroneous, conflicting, and widely diverging. It has been estimated that the cost of experimental research (around 1978) was about $60,000 per published research paper. Since the number of published papers reporting experimental results on the thermal conductivity of tungsten is larger than 100, a total of over $6,000,000 research funds had been spent to produce the confusion of experimental data shown in Figure 7-5. It can apparently be seen from Figure 7-5 that it was not until CINDAS critically evaluated the discordant experimental data and generated the recommended reference values that the true values of the thermal conductivity of tungsten were known.

(For more information contact: Center for Information and Numerical Data Analysis and Synthesis, Purdue University, Purdue Industrial Research Park, 2595 Yeager Road, West Lafayette, Indiana, 47906, USA).



CINDAS

FIGURE 7-5: EXPERIMENTAL DATA FROM VARIOUS SOURCES AND RECOMMENDED CURVE. IT SHOWS THE LOWER THREE SETS OF DATA TO BE COMPLETELY ERRONEOUS.

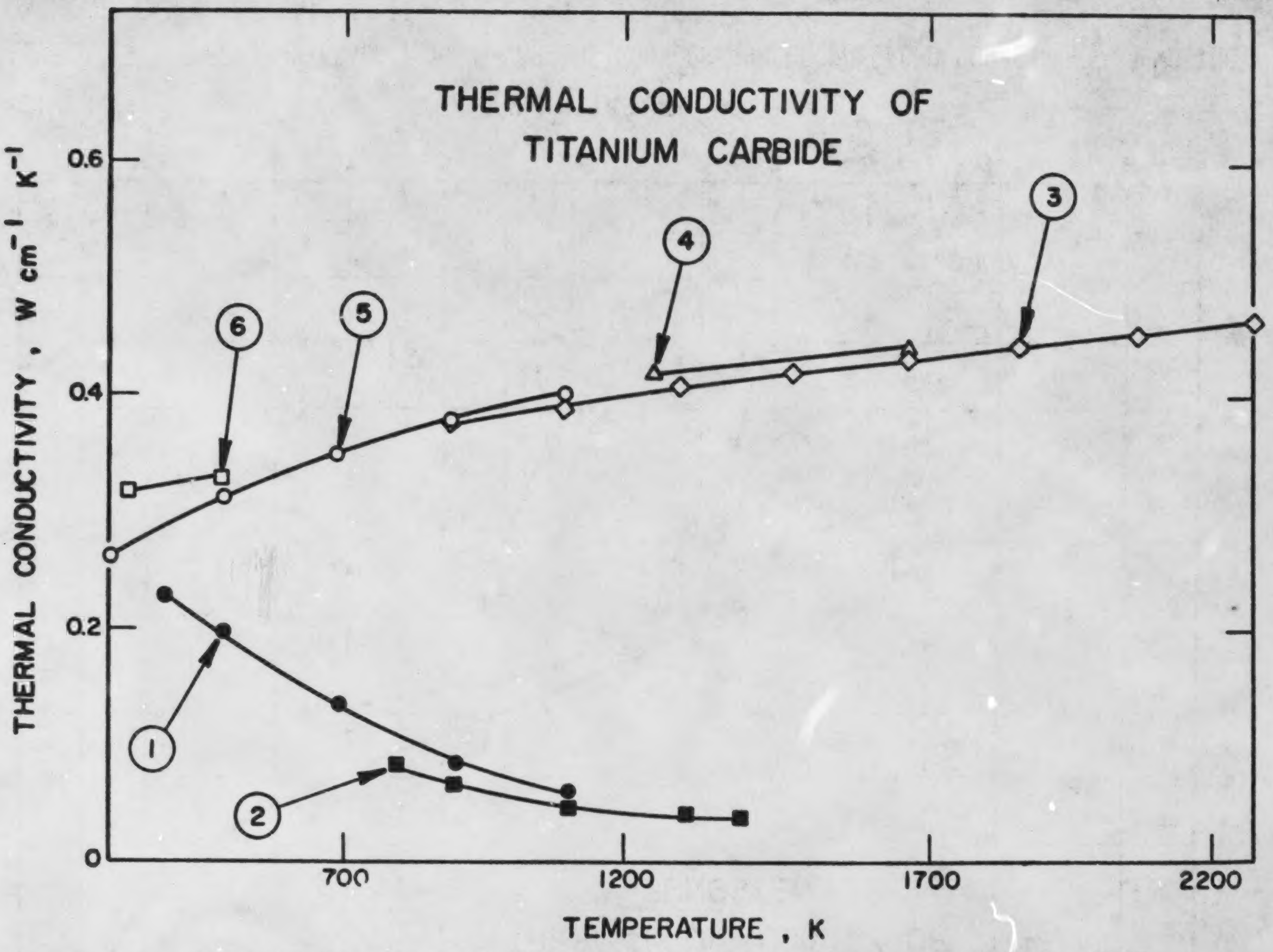


FIGURE 7-4: EXPERIMENTAL DATA FROM SIX VARIOUS SOURCES AND THE RECOMMENDED CURVE. IT SHOWS THE LOWER TWO SETS OF DATA TO BE COMPLETELY ERRONEOUS.

8 INFORMATION ANALYSIS AND SYNTHESIS

8.1 OVERVIEW: PROBLEMS AND NAMES

Scatter, amount and quality -- these are the three basic contemporary information problems. Information on a particular subject or information which may be useful in solving particular problems is often scattered all over the world in a great many information sources. Due to 'information explosion' there is a great and growing quantity of such sources; but unfortunately,many of them are redundant and/or of uneven quality and some are of questionable quality. A number of types of systems have been instituted and many kinds of efforts undertaken to cope with these problems. One such effort is information analysis and synthesis as performed by information consolidation units. In the previous Chapter, we have dealt with the process of evaluation of information and information sources, in this Chapter we are dealing with their analyses and synthesis (which also involves evaluation).

> *ANALYSIS is a process of determining and isolating the most salient information conveyed by a given information source and separating this information into its constituent elements on the basis of predetermined evaluative and other criteria.*
>
> *SYNTHESIS is a process of condensation and distillation of analyzed information from one or more sources and presentation of information in a new arrangement or structure with an interpretative or evaluative point of view.*

In other words, once the information sources have been selected and acquired, they must be examined and further evaluated in order to extract the main points of information to be restructured or synthesized. The merging of this extracted information results in the updating of the state-of-information on the given topic.

In its broadest sense, analysis is involved in any and all information representations (indexing, abstracting, cataloging, etc.) and an abstract or a summary is a synthesis. But evaluative analysis and synthesis is not involved in all representations or products e.g. it is not involved in indexing and abstracting. It is involved in information consolidation. Thus, in this Handbook when we talk about analysis and synthesis we mean evaluative analysis and synthesis, that is, we consider these terms not in their broad but in their specific meaning, involving evaluation.

A number of information systems which call themselves "information analysis centers" provide only indexes, abstracts, summaries and similar nonevaluative products, i.e. they do not provide evaluative analysis and synthesis. In our sense of this term they are not information analysis centers. Unfortunately, among all of the systems calling themselves "information analysis centers" only a rather small minority incorporate these evaluative functions, i.e. a small minority is truly engaged in information consolidation. In contrast, there are other information systems which do perform evaluative analysis and synthesis, but do not call themselves "information analysis centers" such as the Hepatitis Knowledge Base, or the National Clearinghouse for Alcohol Information mentioned as examples in Section 7.6. As yet there are no systems that came to our attention calling themselves "information consolidation units" - this is not yet a name accepted by systems but a term for functions performed. In other words, one cannot go by names of systems, but by the type of functions they incorporate.

8.2 EVOLUTION

The modern concept of evaluative analysis and synthesis has its root in the efforts by 18th and 19th century European scientists to cope with information problems, most notably Leibniz, Berzelius, Gmelin, and Beilstein.[1]

Following the Second World War, many governments in highly industrialized countries started paying increased attention to development and deployment of information analysis centers in a number of specific areas deemed of importance to national economy and life. Eventually the information center concept and approaches have been refined and accepted on an international scale worldwide.

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[1] Gottfried, Wilhelm Leibniz (1646-1716), German mathematician, philosopher, and librarian, started publishing in 1700 Monthly Extracts, which summarized and critically evaluated the significant scholarly work of the time; the publication went on only for about 5 years, but the idea was revived some 100-150 years later.

Jons Jakob Berzelius (1779-1848), Swedish chemist, undertook periodic critical and systematic review of European progress and literature in chemistry and physics and in 1821 he established at the Swedish academy Annual Reports: Progress in Science which was a new form of synthesis of knowledge from home and abroad. His efforts became so well accepted that he is now considered the "father" of modern scientific review.

Leopold Gmelin (1788-1853), German chemist, collected, analyzed and synthesized data and literature in chemistry; he published in 1817-19 : Handbook of Theoretical Chemistry, (in 1852 this became the Handbook of Chemistry); the Institute under his name continues to this day such synthesizing work.

Konrad Friedrich Belistein (1838-1906) born and died in Russia, but a German chemist, collected and synthesized data on compounds and in 1880-1882 published a Handbook of Organic Chemistry, synthesizing information on 15,000 compounds; the publication is continuing to this date.

Each of these scientists was a one-man information analysis center or information consolidation unit. Significantly, except Leibniz all of them were chemists. Is it possible that modern chemistry owes much of its rapid progress and spectacular growth to this early consciousness about the importance of dealing evaluatively with information and producing information consolidation products?

Since three excellent discussions and reviews of all aspects of information analysis centers appeared recently (7-3, 8-11, 8-20); we shall only summarize here some of their major characteristics. In particular, most appropriate in relation to this Handbook are the two UNISIST reports:

Study Report on the Role of Information Analysis Centers in a World Science Information Network, (8-20),

and

UNISIST Guidelines for Establishing and Operating Information Analysis Centres (8-11).

This Handbook is a companion to these reports.

The information analysis centers evolved in response to information problems that were not handled well by libraries and information retrieval systems. These were the problems of obtaining evaluated and synthesized information and not documents from which to do a synthesis. Namely, libraries and information retrieval systems have been instituted and oriented to deal primarily with the bibliographic and subject control of the flood and quantity of literature (publications or documents) and with the access to literature. These are extremely important functions and without them information analysis centers would not be possible and indeed our civilization would not be possible. Information analysis centers, on the other hand, were instituted to deal with the extraction, sifting, filtering and the quality of information in the literature. Thus, these two types of information systems (libraries and information retrieval systems on the one hand, and information analysis centers on the other) are not in competition. They are addressing different problems.

Information analysis centers have these characteristics:

1. They are oriented toward a body of information in a clearly defined and specialized subject or specified mission. They are usually

rather narrow by definition, which limits their appeal and audience.

2. Their primary purpose is to select, evaluate, analyze and synthesize information from the literature. They have problems with evaluation.
3. They are most often staffed by subject specialists, which are usually hard to get.
4. They are serving a defined clientele, with specific information needs stemming from problems they are working on. The specific focus of the clientele changes often.
5. They are expensive. They are not easy to manage. They are hard pressed to show results and cost-benefits. Cost-benefits are hard to show, even though they may be considerable.
6. They produce different products and employ different dissemination methods and marketing than libraries and information retrieval systems. These functions are more fluid, diversified, and harder to implement. They provide additional services.

Information consolidation can be and is performed within this framework of information analysis centers, but it could be performed on a broader scale particularly as to subjects and audiences and within other frameworks as well. Information consolidation is still another step in the evolution of evaluative analysis and synthesis of information from literature. It is addressing the problem of appropriateness.

8.3 PROCEDURES IN ANALYSIS AND SYNTHESIS

The processes on the basis of which analysis and synthesis are performed start long before any actual analysis and synthesis. These preliminary and fundamental processes include:

PRELIMINARY TO ANALYSIS AND SYNTHESIS:

1. *Study of the subject area or mission in which the information will be analyzed and synthesized.*
2. *Study of the potential users and uses for which the analyses and synthesis will be done.*
3. *Organization and systemization of the contents or characteristics of the subject or mission, i.e. a prior creation of a table of contents, classification, typology, or codification for analysis and synthesis.*
4. *Consideration of objectives, resources, and constraints of the system or work within which analysis and synthesis is performed.*
5. *Determination of evaluative criteria for use as the base for analysis and synthesis.*

Without specific guidelines from these five areas no meaningful and rational analysis and synthesis can be performed. In other words, analysis and synthesis cannot be performed in a vacuum.

Documents to be used in analysis and synthesis can be obtained in many different ways and by using different means and aids as summarized in Chapter 6 on Selection. Evaluative criteria can be set in different contexts as summarized in Chapter 7 on Evaluation. Thus, we shall not deal here with those beyond the obvious statement that documents have to be procured and evaluative criteria set before any analysis and synthesis can be done.

The analysis proceeds along these lines:

STEPS IN ANALYSIS:

1. Familiarization with the total contents of a given document or set of documents.
2. Preliminary sorting on the basis of subject contents of documents and evaluative criteria. (First evaluation).
3. Selection and extraction of the most relevant or salient features. Filtering out of unneeded information. Reduction of materials to be handled.
4. Verification of the contents or data in individual extracts. (Second evaluation).
5. Sorting of extracted information into classes and subclasses (headings and subheadings) according to the table of contents, classification scheme or typology for the subject or mission.

The synthesis following analysis consists of:

STEPS IN SYNTHESIS:

1. Comparative arrangement and merging of extracted information within each class and subclass.
2. Comparative evaluation of different extracts or data in each class and subclass. (Third evaluation).
3. Resolution of conflict (if any); or decision to present conflicting information in synthesis.
4. Compression of the information into a structure and form most suited to intended users and uses and in accordance to objectives, resources, constraints

STEPS IN SYNTHESIS CONT'D.:

of the system or unit as a whole.

5. *Evaluation of the final product according to criteria related to users and use. (Fourth evaluation).*

As can be seen, according to evaluation, analysis and synthesis is a four stage process:

EVALUATION STAGES:

1. *Evaluation of information sources (documents).*
2. *Verification of individual extracts or data from each document.*
3. *Comparative evaluation of different extracts or data in each class and subclass.*
4. *Evaluation of the synthesized product or products.*

Criteria used for evaluation in each of these four stages are differing, though related.

EXAMPLES OF OPERATING INFORMATION ANALYSIS CENTERS, INCLUDING DESCRIPTION OF THEIR PRODUCTS ARE PROVIDED IN APPENDIX 1.

9 REVIEWS AND STATE-OF-THE-ART REPORTS

9.1 OVERVIEW

In the spectrum of many possible information consolidation products reviews (of whatever type) take a special and most significant place. They are the highest level of intellectual re-processing of information. By 'review' we, of course, mean the critical, evaluative review and not just a summary of who said, wrote, or did what. Thus, a bibliographic essay, an annotated bibliography, or a fact-report are not a review in the true sense of the word.

The need for and the value of reviews are very well established. They have been extensively discussed in a great many of subjects, in professional and scientific organizations, in international gatherings, and in all kinds of institutions the world over. The high use of reviews is likewise well documented (see a summary of findings in reference 9-3). The roles of reviews are also well delineated. All this is way above discussions about reviews in relation to information consolidation and information analysis centers. Thus, there is much to draw upon when considering reviews and reviewing, including a long and established tradition.

We are considering here the term 'review' as a generic concept covering a number of closely related products and types of reviews.

> *REVIEW is a critical synthesis of the state of knowledge in a given subject or topic; it is a critical examination of information and literature on a subject or topic accommodated in its broader framework.*

Two of the more important types of reviews are:

> *STATE-OF-THE-ART REPORT is a review concentrating on the most up to date information and literature in a given subject or topic.*
>
> *HANDBOOK is a review concentrating on critical data (including structures, formulae and the like) and/or on guidelines for accepted and tested procedures, techniques, processes and standards.*

The procedures for making a review are in essence those presented in the previous chapter on analysis and synthesis. Hence, we shall not deal with them again in this chapter, with the exception of the discussion of specific procedures involved in the example presented in Section 9.7.

One of the crucial points before doing a review is a selection of the subject or topic in which the review needs to be done and indeed can be done. The subject or topic has to be clearly defined and the boundaries set, otherwise the project of reviewing becomes unmanageable. The review should be on a subject or topic for which there is a need for review, either because the literature and information has accumulated in a large bulk of many unconnected items or the users need it. The review can be done only on a subject or topic for which there is enough material to review, otherwise there is nothing to review. Thus, these preliminary decisions have to be weighed carefully.

9.2 EVOLUTION

Historically, the modern reviews derive from the evaluative synthesis as established by European (most notably German and Swedish) scientists in the 19th century. They began to be regularly produced in the latter part of the 19th century. Eventually two types emerged: the *Jahresbericht* (annual report) which was a comprehensive descriptive record and evaluation of annual contributions in a field of study and the *Ergebnis* (results) which was selective, critical and historic and focused on a particular scientific problem and its solution. The first type emphasized the literature-oriented or bibliographic approach and the second type emphasized the subject-oriented or didactic approach. Reviews evolved in two directions.

These two aims and approaches - bibliographic and didactic - are not mutually exclusive. Either type of review has to have both of them present to some degree. A review which has as its primary aim an evaluation of the literature (first type) requires that this is placed within the context of an evaluation of the progress of the subject concerned; conversely, a review which has as its primary aim evaluation of a subject (second type) requires that the supporting literature is also evaluated.

As it evolves, a review must necessarily contain both didactic and bibliographic information although the proportion will vary according to the aim and approach adopted. Thus, the different types of reviews form a continuous spectrum from the seminal work perhaps referring to a very few most important prior works, to the almost list-like review containing perhaps hundreds of references. However, the *combination of these two roles* within a single document is a very powerful one and makes for a product with *many different uses* at the level of different individual users, although these uses or functions are not distinguished in the actual review itself.

9.3 FUNCTIONS OF REVIEWS

There are two types of functions or uses of reviews: (i) historical - those which are fundamental to development of a subject or topic and (ii) contemporary - those which are beneficial to individual users. The description below of these two functions are adapted from A. M. Woodward (9-3). Among the historical or subject functions are:

HISTORICAL FUNCTIONS OF REVIEWS:

1. The peer evaluation of published literature: passing of judgement on what is worth saving in a literature.
2. Collation of information from different sources: this acts as a unifying process for a subject or topic and provides a continuing conceptual framework in which individual works may be viewed in perspective.
3. The compaction of existing knowledge: Extracting the parts of the papers containing new information only, leaving out portions that pertain to verifications, discussions, methods, etc., already known or subsumed.
4. The replacement of primary documents as the written record: (follows from the last point).
5. The identification of emerging specialties: by bringing together various works, the emergence of a new area may well be first identified in a review.
6. The direction of research and work: suggestion for further work.

Among the contemporary or user functions are:

CONTEMPORARY FUNCTIONS OF REVIEWS:

1. *Informed notification of the published literature:* enables individuals to concentrate on the more worthwhile papers; summary of that which is worth knowing; selection aids.
2. *Current awareness of related fields:* Enables individuals to keep abreast of advances in field adjacent to own. Particularly useful for cross-fertilization of ideas among different subjects or topics.
3. *Back-up for other literature searching:* serves as a starting point for searching of more current materials not yet in reviews.
4. *Searching for alternative techniques:* helps in resolving methodological problems in own work; providing data; reference aids.
5. *Initial orientation in a new field:* provides basic didactic and bibliographic information from which to continue work in a new subject or topic.
6. *Teaching aids:* supplements and even replaces textbooks.
7. *Feedback:* provides a measure of a researcher's own published works. (The reviews are fairly heavily used for this function).
8. *Inspiration:* provides suggestions and ideas for further work; stimulation for putting research into practice.

The patterns of use of reviews for various individual functions may differ significantly between various types of users (e.g. older and younger scientists or engineers, place and type of work, status, and so forth). Furthermore, reviews can be specifically structured and oriented to emphasize some of these functions and encourage or favor some of the uses.

9.4 STATE-OF-THE-ART REPORTS

These are a type of reviews which do not have an all-encompassing scope and historical orientation. They emphasize recency and up-to-dateness. Their aim is to describe a very recent situation when they reach their audience. Thus, they are more timely than the traditional review, so they are mostly a current awareness tool. In order to achieve this currency, state-of-the-art reports are often published as informal reports, prepared on demand, oriented to a restricted audience, sold at high prices, and becoming obsolete quite fast.

The state-of-the-art report is used mostly in relation to technological topics and in business and commerce. Description of a few major types and uses follow.

1. *State-of-the-art of a technology*: these summarize, compare and evaluate the advances, characteristics and/or utilizations of a given technology or technological product or process. These differ according to intended use and audience emphasizing:
   * *technical and engineering aspects*: oriented toward technical personnel and engineers in particular. Used primarily in technology design, deployment purchase recommendations, comparison

of characteristics and alternatives and keeping up to date with technology.

- *use aspects*: oriented toward users of technology. Emphasizing details, characteristics, requirements and economics of use (as opposed to details of technical design as in the type above); including comparative reliability, durability, complexity, prerequisites to use, ratings.
- *management aspects*: oriented toward managers, administrators, and economists. Stressing the requirements and comparisons in terms of resources (economic, physical, human, raw materials, etc), planning; alternate choices; negotiating, (licensing, purchase, exchange); related experiences in other industries, organizations, or similar situations; synthesizing drawbacks; availability, etc.
- *strategic aspects*: oriented toward policy makers on a higher level (e.g. ministry officials, lawmakers, delegations, government representatives, planners, funders). Stressing impacts (social, environmental, economic, etc.); strategic requirements and comparisons; political consideration; international aspects; experiences in other countries, particularly in similar situations, etc.

2. *Market reports*: these summarize a state of an industry or a market in terms of its existence, financial strength, economics, profitability, deployment, growth, characteristics, gaps, trends, potential, etc. As in technological state-of-the-art reports, these can similarly be oriented toward different uses and clientele. Their main use is in market decisions and planning, considerations of competition, opportunities, and the like.

3. Statistical composites: these are statistical correlations in a wide variety of technical, market, demographic, scientific and other areas. Specifically composed and evaluated to show cross-dependence of trends, situations, results. May accompany any of the previous types or stand alone, with or without interpretation.

9.5 HANDBOOKS

Handbooks are another type of review. They are very popular and have widespread uses and markets in many subjects -- witness the rather great number of organizations, centers and even commercial institutions engaged in production of handbooks. Some of these outfits are quite large; some of them have been in existence for close to a century or even over a century. The appeal of the handbook is that it is a ready reference book. One doesn't necessarily read a handbook as one would another type of review, but one consults the relevant portion at the time of need and extracts just that data or information which is needed.

In many instances production of handbooks is a continuous operation (as mentioned in examples in previous chapters) or it may be a simple one-time effort (as in this and other UNISIST handbooks which are produced and updated as needed).

There are a number of types of handbooks, the main ones being:

1. Compilation of critical data and formulae on a substance, process, observation and/or phenomenon. These are used mostly in science and technology for experimentation, design calculations, construction, safety considerations, maintenance, replacement, comparison, etc. Publications of evaluated data from social science data archives

are also examples of this type of handbook.

2. Guidelines for accepted and tested procedures and processes. They are aimed at actually doing things, for decisions related to processes and procedures, and for learning as well. They range from step-by-step pamphlets, to how-to books and manuals, to extended discussions of options in given processes.
3. Description and/or references of standards to be applied in doing things. These can incorporate required standards (as in electrical installation) or recommended standards (as in bibliographic work). They can range from tables, to descriptions, to discussions aimed at promoting harmonization and interconnections.

9.6 EVALUATING A REVIEW

In many instances reviews from various information sources are considered for use by information consolidation units. In such a case reviews need to be evaluated as critically as the primary literature. Furthermore, reviews as a product of information consolidation units need to be evaluated. Thus, it is of importance in both respects to have criteria for evaluation of reviews.

Most of the criteria enumerated in Section 7.2 on peer review and refereeing and in Section 7.5 on evaluation of information sources apply to evaluation of reviews as well.

However, there are a few more criteria for reviews, stemming from the unique dual nature and multiple functions of reviews (as discussed in Section 9.2).

These additional criteria pertain to:

ADDITIONAL CRITERIA FOR EVALUATING REVIEWS:

1. *Completeness:* the degree to which both the subject and the literature on the subject were covered; the degree of insight shown.
2. *Perspective:* purpose, direction, orientation; the degree of appropriateness in relation to both a given subject and for a given audience.
3. *Analysis:* the thoroughness, depth and breadth of analysis; degree of collation of information from different sources; degree of evaluation applied in analysis.
4. *Synthesis:* degree of compaction - relations drawn; extent of superseding of previous information and literature; power of inferences; degree of drawing from related subjects; degree of evaluation applied in synthesis.
5. *Value added:* identification of emerging specialties; introduction of new hypotheses or theories; suggestions for future work (research, translation into practice, etc.); serving as an inspiration, stimulus.
6. *Utility:* the degree to which a review can serve multiple functions (e.g. as enumerated in Section 9.3) and not only one or two functions.

9.7 EXAMPLE

The example here is drawn from the Information Center for Hearing, Speech and Disorders of Human Communication (9-2). The Center has been preparing comprehensive critical reviews and state-of-the-art reports, but it has encountered difficulties in their preparation and was seeking solutions. Difficulties encountered included deciding that a review is needed in a topic and recruiting a suitable author. The reviews should be written by experts with solid scientific background in the subject. The authors must be able to evaluate the on-going research, synthesize it into concepts and theories and write well. However, it was hard to interest scientists in the preparation of major review papers. It was found that the reluctance of scientists to commit themselves to writing major reviews, stemmed in part, from the large amount of time they would have to devote to writing the review. Thus, a compromise measure had to be devised, one which would save time for reviewers and still produce a critical type of review.

This product was called a Biblio-Profile, which is a brief state-of-the-art report on a specific topic followed by a comprehensive bibliography. The scientist-reviewer is asked to write a brief review and the Information Center provides as much bibliographic and editorial assistance as the author requested. The topics for review are selected by a local advisory committee, which also suggests the individuals considered best qualified to prepare the profiles. The author is invited and provided with instructions, editorial and bibliographic assistance (searching, typing, manuscript preparation, etc.).

The profile part of the Biblio-Profile provides a brief introduction to a field, a brief assessment of the state-of-research on a specific topic, and an indication where gaps in knowledge exist; the comprehensive bibliography may contain both current and older, classic citations. The instruction for preparation of Biblio-Profiles, presented in Figure 9-1, illustrates the approach to and organization of the profile.

Biblio-Profiles in a number of subjects have been prepared (e.g. Neuroanatomy of Speech, Surgical Treatment of Deafness, Language Development in the Normal Child, Auditory Physiology, Otitis Media, etc.). They have been printed and sold, as well as stored in the computer for searching. The product has a number of advantages: it is a separate which can be prepared and published quickly (it is not needed to wait for a publication of a journal); it provides recognition for authors. However, these products do require marketing and promotion, since no encompassing publication as journals carry them. Biblio-Profile is a multipurpose document involving characteristics and uses of both: state-of-the-art and comprehensive bibliography.

(For more information, contact: Information Center for Hearing, Speech and Disorders of Human Communication, The Johns Hopkins Medical Institutions, Baltimore, Maryland, 21203, USA).

FIGURE 9-1: GUIDE FOR AUTHORS OF BIBLIO-PROFILES FROM THE INFORMATION CENTER FOR HEARING, SPEECH, AND DISORDERS OF HUMAN COMMUNICATION

INTRODUCTION

A Biblio-Profile is a capsule state-of-the-art report on a specific topic, followed by a comprehensive bibliography of recent references. Each Profile presents a brief statement of the problem, why the subject is of concern and what is being done about it.

In preparing a Profile, you should be particularly concerned with the scope of the topic, citations of the most recent referenced material, format and composition. You should also be willing to exercise rigorous editorial control over the inclusion and arrangement of the references.

Editorial assistance from the Information Center includes furnishing each author with a search of the relevant literature, typing the Profile and its Bibliography in final form, furnishing the author a proof set for his final approval and providing him with three copies of the finished Biblio-Profile.

Profiles written for the Biblio-Profile series can be handled promptly and efficiently if they are prepared and submitted in the form described in this guide.

WRITING THE PROFILE

Organize your material carefully. First, state the problem in a brief sentence or two that places the topic in perspective statistically, clinically or theoretically. For example, if the Profile concerns a hearing disorder, state the estimated population in the U.S. that is afflicted with that disorder.

Briefly present the important research conducted in the past year or two, stating the findings and their significance. Give full references at the end of the Profile but cite the work in the text as (Smith, 1972).

You may refer to work in progress or to works in press, but be certain to give enough information so that interested parties can write for additional details to the individual or group being cited.

Time–Cover the work of the past two years, although you may refer to classic work of an earlier period if it is useful or necessary.

Trends–If possible, provide information relevant to your topic on the recent trends in research, patterns of testing or management of patients. Especially emphasize achievements and applications in the past year or two. These may be methodological, clinical, basic or theoretical.

Gaps–Point out where gaps exist in knowledge or its application or where more research or education is needed.

PREPARING THE MANUSCRIPT

Prepare your manuscript in the following form:

Length–The Profile should be 2 to 8 pages when typed double-spaced. Use bond paper for the first copy and submit one duplicate. Do not use single spacing anywhere, even in references.

Title–Begin the title with a word useful in indexing and information retrieval (not "effect of" or "program on").

Style–Use centered and side headings at appropriate places in the text to distinguish the various topics and subtopics. Keep these headings short–no more than 35 characters and spaces. Avoid specialized jargon and abbreviations, but use such technical terms as are necessary. Define those that may be known only in your field. Use the active voice more than the passive. The passive voice usually requires more words and it often confuses meaning.

Use a good general style manual. *A Manual of Style* of the University of Chicago Press, the style manual of the American Institute of Physics and the *Council of Biology Editors Style Manual* are suitable. *Scientific Writing for Graduate Students*, Woodford, F.P., Ed.: The Rockefeller University Press, is also useful for the organization of material, as is the *American National Standard for the Preparation of Scientific Papers for Written or Oral Presentation*, ANSI Z39.16 (1972).

References and Notes–Number all references to the literature in the order in which they are cited in the text. An example of the form of references is:

> Hosoda, S.; Suzuki, H.; Kawabe, Y., et al.: Embryonal rhabdomyosarcoma of the middle ear, Cancer 27(4): 943-947 (Apr.) 1971.

Summary–Provide a summary statement at the end that states the present position of the field and its needs.

Identification–At the end of the Profile, write your full name, graduate degrees, title of present position, address and the date that you wrote the Profile.

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10 TECHNICAL WRITING AND SCALING TO AUDIENCE

10.1 OVERVIEW: CONCEPTS AND NEED

Writing is an art. Information consolidation depends very much on that art. For the extent and amount of use of an information consolidation product will not only depend on the subject or topic covered, but also on the way it is written. How can this art be improved upon? From the lessons learned in technical writing.

While much of the scientific and technical literature contains information potentially useful to a wider audience than just the immediate specialist, most of it can be followed by only the highly initiated. In part, this is because of the complexity of the subjects covered in the literature; however, in good part this is also because of the way that the literature is written. The language and style usually found in scientific and technical articles is a most effective barrier for their wider use. As a rule, an intelligent and even highly educated layman cannot follow the 'average' scientific and technical article. Even scientists and engineers cannot follow the literature outside their own subject. Science and technology worldwide is doing a very poor job of explaining themselves.

Yet there are many situations where science and technology must explain questions like: what are the problems attacked, what are the issues involved, what is happening and going on, what are the findings and results, what are the impacts and consequences of solutions, how can the results be applied and why should they be applied? To underscore the problem: it is not only the complexity of the subject treated, but in a large measure also the forbidding language and style of scientific and technical literature that is a hindrance to such explanations.

Thus, for a long time there was a need felt to produce writings that would translate the scientific and technical literature and information into a style, presentation, and language which can be followed by people other than the immediate subject specialists. A generic name for such translation or transformation efforts is technical writing. Incidentally, the translation mentioned above can involve the same language (e.g. from technical English or Spanish into non-technical everyday English or Spanish) or different languages (e.g. from technical English into everyday Portuguese).

> *TECHNICAL WRITING is a presentation of the essential features of scientific and technical subjects and issues in ways that will make them more understandable and easier to absorb by a wider audience. The aim of technical writing is effective application and wider understanding of scientific and technical advances. Technical writing is then the scaling of scientific and technical information to a given audience.*

In other words, technical writing is concerned that a message be conveyed, understood and absorbed in a way that can be retained by the largest number of people in a social group or audience in the shortest possible time.

Technical writing is based on the experiences and the credo that even the most complex scientific and technical topics can be presented in a simplified way, if not in all of the detail, then in the essential details of importance to an audience. Technical writing has a long and distinguished history above and beyond the present concerns with information consolidation. University courses are taught in technical writing, textbooks exist (e.g. 10-1, 10-2, 10-6, 10-10), prizes are given for the best achievements, and professional societies of technical writers have been established. Technical writers are employed by newspapers, industrial firms, businesses, health agencies, governmental departments, information analysis centers, scientific and technical journals, publishers ... and some of them are on their own in the business of writing how-to manuals. Some of them should be trained or employed by information consolidation units.

10.2 ASPECTS IN TECHNICAL WRITING

Can one just plunge into writing? No. Technical writing has to be carefully planned for maximum effectiveness. A number of aspects or elements have to be considered, among them are:

ASPECTS IN PLANNING OF TECHNICAL WRITING:

1. *Audience and human psychology: to whom will the message be conveyed?*
2. *Subject and source: what subject or topic will the message cover and from what source will it be derived?*
3. *Message and use: what is it that should be conveyed and for what use?*
4. *Writing principles: how should it be conveyed?*

10.3 AUDIENCE AND HUMAN PSYCHOLOGY

Reaching an audience is the aim of technical writing. Audience is the king. Thus, technical writing starts and ends with consideration of an audience.

Technical writing tries to overcome the language problems and psychological barriers in relation to an audience. Knowledge of human nature in general, and of the target audience in particular is essential for the solution to these problems. This is needed for an effective adaptation and scaling of writing to a reader's (or listener's or viewer's) needs.

The important factors to be understood about an audience are myriad. They may well be selected from the variables involved in information transfer as described and classified in Section 4.5. The methods for audience study are summarized in Section 4.6. Briefly repeated the variables are:

1. Stages or phases in the diffusion process at which the audience is in relation to the subject and message to be conveyed.
2. Individual characteristics of the members of the audience, including their language and linguistic behavior, comprehension level, human relations, motivation, time available or likely to be alloted to the message.
3. Environmental or social characteristics, including the cultural and other norms, the political framework, economic and other situations, the resources available for solution of the problem.
4. Characteristics of the subject as perceived by the audience, the desired and essential attributes. What is it that they want or need to know about the subject?

5. Communication characteristics: the way the audience communicates, as to information sources, structures, forms, channels and systems.

It is important to consider not only the tangible factors, but also the intangible ones such as a respect for and enhancement of human dignity, awareness of sensibilities, life-styles, etc. One should also consider that the human mind can only process a limited amount of information at a time, that too many facts or ideas in a short space make reading difficult, that readability is affected by a great many factors and that writing and comprehension levels have to be matched.

In addition to the study and consideration of a particular audience it is helpful to know about generalizations from previous studies and from common sense. For instance, it is helpful to know that unskilled laborers generally have limited vocabularies, use few specialized terms, can do simple arithmetic, but not algebra, know little physical science, and may be limited to reading only the simplest signs and safety notices.

Semi-skilled laborers generally know little math beyond arithmetic, can interpret only simple line graphs, understand only the obvious scientific principles, and know little about jobs except their own or those closely related. Therefore materials written for them generally would give only essential job and safety instructions.

On the other hand, skilled laborers are generally highly trained, know the technical terms applied to their equipment or materials, know "shop" arithmetic and perhaps simple algebra, can read tables and use routine instruments in their field, and know the symbols and abbreviations commonly used in their trade.

In the case of new literates, it is helpful to consider that they must be provided with written material that is within their comprehension and has interesting, vital and useful information. The alternative is that the new literates will see little value in reading and forget what they have learned.

In cases of large technically oriented organizations it is helpful to realize that there are always a number of non-technical people. They should understand what the technical problems are, what issues are being addressed; they should be aware of what it is that the organization is doing. They should also be able to make a good case for the work of the organization both on and off the job. Again, technical writing is an appropriate tool to help in that respect.

10.4 SUBJECT AND SOURCES

The subject of technical writing may be given by an organization or dictated by itself from the advances in a topic, existence of a product or process, development of a situation, etc. Or the subject can be determined from a study of the audience, direct demand or even command of the audience, existence of a market and need, etc. In some instances, the subject is predetermined for technical writing without the possibility of a choice, in others there is a choice of subjects to match a need - in that case selection should be given careful consideration.

Both situations involve the selection of sources from which the technical writing will proceed. These sources can be one or a combination of these:

* open literature as available in journals, books, monographs, proceedings, etc.
* fugitive literature as available in reports.

* internal documentation as available in organizations (industries, institutes, agencies) such as laboratory reports, internal memoranda and reports, work specifications, correspondence, blueprints, etc.

* subject specialists: interviews with scientists, engineers and other specialists.

All the sources have to be selected and evaluated according to the criteria elaborated in Chapter 7. But, let us elaborate on the last source mentioned: the subject specialist. Technical writers usually have some background in science or technology, but in no way can they be specialists in every possible subject that becomes the topic of their technical writing. They have to rely more often than not on subject specialists for technical explanations. They also may often be in a position to interview subject specialists (e.g. engineers working on a project or product) as a sole source for a given write-up. Such interviews and communications with scientists, engineers and other subject specialists are not an easy proposition. In many instances subject specialists are tight-lipped, apprehensive, distrustful, or patronizing... they may be wary that the write-up will be an oversimplification... they may not be good in explaining things to people other than their peers...they may be more concerned about answers and details than the message... they may not see the necessity or importance of a write-up scaled to an audience... they also may quite often be very defensive and not persuasive. Careful interview techniques have to be developed that will elicit proper response and in addition educate the specialists on the importance of technical writing and even make them appreciate it and reduce the problem of acceptance of technical writers and technical writing.

10.5 MESSAGE AND USE

Not all the details of a scientific or technical subject can and should be presented in a technical writing. Many details are irrelevant for a given audience and given use. It is not a description or an abstract or summary that is to be presented, but a message. The goal of technical writing is to get a message across.

An audience for which a technical write-up is intended as a rule does not have a deep understanding of the scientific or technical subject presented. This means that an audience should not be beaten over the head with detailed information which they cannot understand and don't care about anyway.

In that respect, it is of utmost importance to select precisely the details or message about the subject that should be conveyed. Since not all of the details and aspects of a subject or topic can be presented there is an inevitable loss of accuracy in the sense of completeness. However, it is always better to choose comprehensible incompleteness, than incomprehensible completeness.

The message to be conveyed should be selected in coordination with a number of factors: the level of audience, the intended uses and effects desired, and the subject itself. The central question is: what is it that the audience really wants or should be informed about with this specific subject or topic?

A strong, clear outline of the message should be developed before any actual writing. The outline will help both in focusing on the message and organization of the presentation. This outline should include every topic required with subdivisions as necessary. These should be put in a logical order, placing the important points first and last.

10.6 WRITING PRINCIPLES

To be effective technical writing has to adhere to principles of good writing in general, and to other more specific principles in particular, including:

PRINCIPLES
OF
TECHNICAL
WRITING:

1. *Accuracy: make sure that the material selected for technical writing is accurate in accordance to the most up-to-date information available.*
2. *Logical progression: follow a logical progression of thought.*
3. *Simplicity: keep it simple.*
4. *Word choice: select words for precise communication, avoid jargon.*
5. *Style and grammar: choose style and grammar for direct and effective communication, not art.*
6. *Analogy: make liberal use of examples familiar to audience.*
7. *Sensitivity: follow any restrictions and adhere to the sensitivities of the audience.*

1. Accuracy: Make sure that materials, data and details selected for technical writing are accurate in accordance with the most up-to-date information available.

   * Check and verify all of the technical details and the accompanying explanations and statements.

* Check the reliability of data to be presented.

* Check the accuracy of any accompanying graph, blueprint, illustration, etc.

2. Logical Progression: Follow a logical progression of thought. The logic required in scientific writings offers a good example of the type of progression needed. Here is an explanation by Zinsser (10-11) which in itself is an example of excellent technical writing:

> "Let me ... ask you to imagine scientific writing as an upside down pyramid. Start at the bottom with the one fact that a reader must know before he can learn any more. The second sentence broadens what was stated first, making the pyramid wider, and the third sentence broadens the second, so that gradually you can move beyond mere fact into significance and speculation - how a new discovery alters what was previously known, what new avenues of research it might open, where the research might be applied. There is no limit to how wide the inverted pyramid can become, but the reader will understand the broad implications only if he starts with a narrow fact."

3. Simplicity: Keep it simple.

* Include only the necessary detail. Save reader's time by omitting unnecessary detail.

* Do not clutter.

* Strip every sentence to its clearest components; avoid words that do not serve any function.

* Present one fact or idea per sentence; break complex thoughts into single sentences.

* Give preference to the short over the long, the non-technical over the technical, and the familiar (to the reader) over the unfamiliar.

4. Word Choice: Select words very carefully for precise communication and avoid technical jargon:

   * Be brief, clear, direct and simple. Use the simplest words that will carry the message without offending the reader's intelligence. Use a variety of words, preferably pictorial words in the reader's experience.

   * Use strong, definite, concrete, precise, straightforward terms. Strive for easy effective expressions and for active voice.

   * Choose words that relate to the intended meaning as exactly as possible. Be sure words have the same meaning for writer and reader. Use words that would be used in a face to face conversation.

   * Define technical terms the first time they are used. If suitable, provide a list of definitions.

   * Spell out abbreviations, avoid them if possible. Identify symbols the first time used.

   * Arrange words correctly for clarity, putting related words together. (In English, eliminate words such as "it", "that", "there", "could", and "would"; when possible reduce longer expressions to single words, e.g. use "now" for "at the present time"; where possible replace neutral verbs (such as "be", "do", "have") with more descriptive verbs; use lean verbs (e.g. "use" instead of "utilize".)

5. Style and Grammar: Choose the style and grammar with care for effective communication.

   * Write like a person close to the audience, not like a remote scientist.

- Maintain a unity of mood and style. Make ideas flow smoothly from beginning to end. Link thoughts. Use enough conjunctions and transitional phrases.
- Maintain a unity of tenses. Make subjects of most sentences, people, processes or things.
- Make relationships clear. (In English, place modifyers correctly and avoid their overuse; limit use of prepositional and infinitive phrases.)
- Break up long sentences and paragraphs.
- Adjust style to the audience. For instance, cartoon style is effective for new or limited vocabulary readers - but watch not to talk down to the audience.
- Make writing interesting, and bolstering to reader's personal, institutional, regional or national ego. Try to motivate.
- Minimize negative reactions by using positive expressions. Do not be defensive.
- Keep the reader's attention by using such devices as citation of authority and common grounds materials, contrast, quotations, emphasis of benefit to reader, rhetorical questions, startling statements. Use humor if possible.
- Supplement, if possible, the writing with visual aids such as illustrations, pictures, simplified charts, graphs, statistics, maps or tables. Place the visual aids close to the discussion points.

6. Analogy: Use examples out of audience's experience to get a point across.
   - Make a liberal use of analogies, examples, and parallels to illustrate, explain or underscore a point.

- To explain quantities, especially large ones, use measures and examples that will convert them to a human and familar scale.

7. **Sensitivity**: Follow any restrictions and adhere to the sensitivity of the audience.

- Be careful about any legal restrictions: copyright, classified or confidential information, libel, legal liability, etc.
- Be sensitive to moral and ethical implications.
- Be sensitive to political, social and cultural reality. Be sensitive to authority structure.
- Be sensitive to the prevalent communication patterns and available time of the audience.
- Try to get some of the potential users to react and ask questions about the write-up during and after composition. Test the product.
- Have peers evaluate a draft.
- After the product is in use, try to get feedback from users on a continuing basis. Improve the product as a result. Learn from mistakes.

10.7 TRANSLATION

Translation from technical English to non-technical English is a difficult proposition. But, the difficulty increases many fold when the translation is from technical English (Russian...) into non-technical, everyday Spanish (Arabic...) It is the technical terminology that poses most of the problem. In many languages development of native, technical vocabulary has not kept pace with world-wide technical development. Thus, the scientists, engineers, managers in a country simply take a technical term from a different language (e.g. English) and adopt it almost without change as a part of the vocabulary in their own language. The non-technical speaker in that language is left even more in the dark than ever, when it comes to understanding the technicaleeze. Namely, scientists and engineers in their own language speak a foreign language in both senses: technical vocabulary foreign and really foreign.

Thus the translation efforts have to take into account these two levels of foreign-ness. In many instances such translation efforts have to involve a lexicographer's job of development and approval of a native vocabulary.

10.8 EVALUATION OF TECHNICAL WRITING

The evaluation of technical writing in a given language should first and foremost be subjected to the criteria of good writing for that language. Languages do differ, so do criteria. We cannot state what are such criteria in different languages, but we shall concentrate here on some criteria that are relevant for evaluation of technical writing in all languages.

CRITERIA FOR EVALUATION OF TECHNICAL WRITING:

1. *Subject or topic*: Is it well selected? Clear in its borderlines? What is the degree of detail? Necessary detail, unnecessary detail? Is it simple?
2. *Message*: Is there a focus? A central theme? An orientation? A need for that or some other message on the subject? Are the meaning and intent clear?
3. *Audience*: Does it address an identifiable audience, level, social group? Is it in accordance with such an audience? Scaled to an audience?
4. *Accuracy*: Is it accurate? Factual? Reliable? Has it any purely speculative conjectures or conclusions? If so, are they clearly identified as such?

5. Logic of presentation: Is it logical? consistent? Do facts, ideas ... build on each other, starting from basic or simple to more complex? Is the sequence right for easy following? Are all parts relevant to the whole?

6. Terminology: How much technical jargon is there? Are new words identified and defined? Are new words easily acceptable? Is there any unnatural or specialized use of familiar words?

CRITERIA
FOR
EVALUATION
OF
TECHNICAL
WRITING
CONT'D.:

7. Grammar: Is the grammar the accepted "spoken" grammar? Is it academic? Or as used in legal, business, technical government ... writings? Are sentences short enough? Are subject, verbs, and associated phrases clearly related?

8. Style: Is it appropriate? Interesting? Boring? Is the title appropriate? Are the lead-ins and endings forceful? Written in active voice? Is there a unity of mood? Unity of tenses? Any humor? Is there a human interest element?

9. Analogies: Are there any examples at all? Are they appropriate, related to the experiences of the audience? Are the quantitites also given in terms of a human scale, easily understood.

10. Sensitivity: Are cultural, economic, social, political realities taken into account? Are there any faux pas of linguistic, social convention or similar nature? Is there recognition of moral and ethical aspects? Is the whole thing stimulating, inspirational?

CRITERIA FOR EVALUATION OF TECHNICAL WRITING CONT'D.:

11. *Packaging: Are the graphic, sound or visual aspects well done (print, graphics, illustrations, ... or in the audiovisuals: picture, sound, film)? Do the arrangements make for easy reading (viewing, listening)? Does the packaging entice?*

10.9 TWO EXAMPLES

Both of the examples presented here are taken with permission from the Instructor of Writing Handbook (10-2). Both pertain to popularization of a technical topic with a definite message.

1. Example of rewriting of an article:

   A. Original article:

   Calcium:

   Everyone needs calcium, which is largely responsible for the strength and hardness of teeth and bones. Yet most people don't get enough. Scientific research is beginning to provide evidence which suggests that sustained low intakes of calcium may be a contributing factor in osteoporosis (a debilitating disorder most common in middle and advanced age in which the density of bone decreases, leading to spontaneous fractures. This disease is severe enough to cause the vertebrae in the back to collapse, resulting in a height loss.) Of course, bone loss may begin long before it manifests itself in bone fractures, so it makes sense to ensure that your calcium intake is adequate throughout life. The richest sources of calcium are milk and milk products, sardines, canned salmon and green vegetables.

   B. Rewritten article:

   Calcium

   Do you drink milk? Do you eat cheese? Do you eat greens? These foods help you to get the caldium that you need.

> You need calcium to make your teeth and bones strong and hard. Lack of calcium makes the bones become thin. Thin bones break easily. Thin back bones make older people become shorter.
>
> Don't wait until your bones break easily. Don't wait until thin back bones make you shorter. Drink milk. Eat cheese. Eat greens. Make sure that you get enough calcium all your life.

2. The second example is much lengthier. It shows six ways to express a message. It is wholly reproduced as presented by the authors, in Figure 10-1.

(For more information contact: R.S. Laubach, Laubach Literacy International, Box 131, Syracuse, New York 13210, U.S.A.)

FIGURE 10-1

6 WAYS to Say

"Pedestrian Be Careful"

By

Frederick T. Yates

International Cooperation Administration

Korea

With

Robert S. Laubach

Lecturer in Literacy-Journalism

Syracuse University School of Journalism

Republished with permission from Instructor of Writing Handbook. New York: New Readers Press, Laubach Literacy International, 1980.

FIGURE 10-1 CONT'D.

PREFACE

These examples will be helpful for students of writing for new literates, or others who write materials for the "man in the street." The examiner of these "Six Ways" will be able to adapt ideas for his own use in other subjects and other languages.

The graphics--layout, illustration, choice of type, size of page, etc.--are of great importance also. But it is the purpose of this booklet to consider only the words, and how they may be used to "get across" the message.

Here, in brief, are our opinions of the usefulness of the Six WAYS:

WAY No. 1. The Essay

The essay is the most over-worked, and often the least effective, method of presenting any message to the common man. A well-written essay may have beauty of composition well appreciated by the professor of literature. But its appeal to the man in the street is pretty close to zero.

WAY No. 2. Simplified Essay Form

In this form there is considerable emphasis on simplicity, or what many call "readability." But the essay form still lacks any compelling attraction, so that the reader will eagerly continue throughout the composition. The essay does have its place, in magazines and newspapers. But don't overdo it, and always keep the essay short and simple!

WAY No. 3. Rules in Outline Form

Here is the most direct type of communication through the printed word. There is no attempt at literary style. The information is carried in as clear words as possible--and as few words as possible. There may be some lack of interest because of the absence of "human interest." But for leaflets or posters, where the available space must be used to the best advantage, the outline form is recommended. Incidentally, no one leaflet or poster should have as much content as in our example. There is enough material here for a dozen leaflets or posters, each emphasizing one important point.

WAY No. 4. The Conversation Skit

This is frankly an attempt to get people involved in reading the "story," or the "he said, she said" dialogue. Because of the phenomenon called "human interest," everyone, in every part of the world, is interested in listening to others tell a story, or in reading what others are actually saying. Information is not packed in so tightly as in WAY No. 3, as some of the words must be given to the framework of the story. But the important thing to remember is that this way will attract and hold readers' attention! The "story" need have no real plot (this example doesn't), or it may develop a plot and bring to life characters who may keep it going over a long series of articles. The cartoon strip is a variation of this form, and the development of talented cartoonists, or writer-cartoonist teams, is to be encouraged.

FIGURE 10-1 CONT'D.

WAY No. 5. Question and Answer

Another direct way of getting across information. This one has more interest than does WAY No. 3. It is a good technique for communicating specific items of advice or information. It stimulates conversation among the readers; it provides for review and reference.

WAY No. 6. Rimes

The American advertising industry has made the United States all too conscious of rimes and jingles. We believe they deserve to be used with new literates more than at present.

WAY No. 1

THE ESSAY

PEDESTRIAN TRAFFIC SAFETY

The coming of the modern age to Korea has brought both great benefits and concurrent hazards. Motorized transportation is one of the boons of this modern evolution, but this high speed traffic has resulted in a growing number of accidents each year. Many of these accidents involve pedestrians and such accidents are not always the fault of the drivers. All too often they are the result of pedestrian carelessness, and could easily be avoided.

Since most Koreans are proud to think that Korea is now taking its place among progressive countries of the world, they should be willing to accept the unpleasant as well as the advantageous consequences of this modern progress. They know that the new buses, taxicabs and private automobiles enable them to travel swiftly and comfortably. They realize that the motor trucks speed up deliveries at lower costs and promote the flow of commerce and industry. Therefore, they should cooperate with keeping the roadways clear for the smooth flow of traffic. However, many Koreans seem to think they are still living in the leisurely days of the ox wagon and the hand cart. They stroll down the middle of busy streets, greeting their friends and perhaps stopping to gossip as in the olden days, while horns blare and brakes squeal and traffic swirls about them. Such foolish persons are inviting injury to themselves and others. They should stay on the roadside.

Other foolish persons step out into the road and into the path of moving traffic without so much as a glance in either direction. When a horn blows in their ears and a frightened driver shouts at them they are actually surprised and resentful. They do not seem to realize that they are walking into trouble and possible destruction.

FIGURE 10-1 CONT'D.

Some pedestrians, especially children and nervous old people, often find themselves in the middle of the street with traffic rapidly approaching in both directions, and suddenly lose their heads. They dart back and forth uncertainly, or just close their eyes and run for the sidewalk. A driver can usually avoid a standing or slow-moving figure, but he cannot outguess someone who is on the run.

Too many children are allowed to play in busy streets. It is true that most communities lack adequate playgrounds, but children can be taught to stay on the side of the road. Very young children should not be allowed outdoors unattended, for they are sure to stray out into the road.

At busy intersections where there are traffic police or traffic lights the signals should be observed carefully. To cross the street against the signal or to cross at other than crosswalks is to invite accident. Jay-walkers also slow up traffic.

Pedestrians walking along narrow streets or country roads at night should wear light clothing. The fact that the pedestrian can see an oncoming car does not mean that the driver can see him, especially if the walker wears dark clothes. The pedestrian should also walk facing traffic so that he can avoid vehicles that are traveling close to the margin of the road.

REMEMBER -- THE LIFE YOU LOSE MAY BE YOUR OWN!

WAY No. 2

Simplified Essay Form

LET'S ALL WALK SAFELY!

Our city streets are busy places. They are also dangerous places. They are full of speedy cars and other fast-moving traffic. This modern traffic can injure you if you are not careful. Even if you are walking you must watch out for traffic.

Here are some things you must remember. Your family should remember them also.

Do not walk in the middle of the street. Do not stop to talk to friends in the road way. Stay on the side of the street. There you will be safe from traffic.

Must you cross the street? Then stop and look in both directions. Be sure no traffic is coming. Now it is safe to cross the street. Cross the street quickly. But DO NOT RUN.

You may forget to be careful. You may get caught in the traffic. Don't be nervous. Don't run back and forth. Don't rush to the side of the road. Stop! Wait for a break in the traffic. Then continue to cross quickly.

Keep your children off the streets if possible. Find a safe place for them to play. If they must be on the streets, keep them out of traffic. Teach them to walk and play at the side of the road. Teach them how to cross the road safely. Don't allow very young children to be on the street alone.

On busy city streets watch for the traffic signals. Cross the streets only at street corners. Watch the signals of the traffic police. Watch the traffic light. The green light means you can cross safely.

At night wear light clothes on dark streets or country roads. Face the on-coming traffic. Be sure to walk on the side of the road. You can see the traffic, but the driver often cannot see you. At night wear light colored clothes when you must walk along the road.

REMEMBER -- WALK SAFELY ALWAYS!

FIGURE 10-1 CONT'D.

WAY No. 3

RULES FOR SAFE WALKING

Be safe! Follow these rules for safe walking:

ON BUSY STREETS:

Keep off the road way. Walk on the side of the road.

Look both ways before you cross the street.

If you are caught in traffic, stop--wait--continue when it is safe.

SAFETY FOR CHILDREN:

Don't let children play in the street.

Teach them to walk on the side of the road.

Teach children to look both ways before crossing streets.

Don't let very young children be on the street alone.

WATCH THE TRAFFIC SIGNALS:

Cross busy city streets at the street corners only.

Watch the traffic policeman for the signal to cross.

Cross on the green or yellow light only. The red light means danger.

Don't try to make your way through moving traffic.

WALKING AT NIGHT:

Wear light colored clothes on dark streets or country roads.

Walk at the side of the road.

Face on-coming traffic so that you can get out of the way if necessary.

Carry a light on dark country roads.

IT'S BETTER TO BE SAFE

WAY No. 4

THE CONVERSATION SKIT

Easily adaptable to a radio skit, or presentable on the stage or movies.

POLICEMAN: Ho, old man! Why do you walk in the middle of the street? Don't you know it's dangerous?

OLD MAN: I always walk in the middle of the street if I want to. I can see more things. My friends can see me. Besides, the road is smoother.

POLICEMAN: It is also more dangerous. Traffic will not always go around you. Come over here. Walk on the side walk. Be safe.

(A horn blows. A car stops suddenly.)

DRIVER: Be careful, lady! Look where you're going!

LADY: I'm sorry. I didn't see you.

POLICEMAN: Of course you didn't see the car. I saw you step out into the road. You didn't stop and look both ways. You were not careful...Now--look at that old lady!

(Policeman points to old lady in the middle of the street. She is afraid. She runs back and forth.)

POLICEMAN: Stand still, old lady. (He blows his whistle and stops traffic. He leads the woman to the side walk.)

OLD LADY: Thank you very much. I was afraid of all those cars.

POLICEMAN: You should stop and wait. Look both ways. When it is safe, cross over quickly. DO NOT RUN!

OLD LADY: I'll remember next time.

(Policeman sees boys playing ball in the street.)

POLICEMAN: Hey, boys, get off the street. It is dangerous to play in the street. A car may kill you.

LITTLE BOY: Where shall we play, then? We have no yard. There is no other place to play.

POLICEMAN: I know. However, you must not play in the street. You must stay on the sidewalk.

(A woman screams. She rushes out into the street. She picks up a child and runs back.)

MOTHER: My poor baby! He was almost run over!

POLICEMAN: How did he get out into the street?

MOTHER: I don't know. I was in the house. My child was playing on the side walk. I came out in time to see him in the street.

POLICEMAN: You left him playing alone? Such a little baby?

FIGURE 10-1 CONT'D.

MOTHER: Well, I can't watch him all the time.

POLICEMAN: He's too young to be left outside alone. Have someone watch him or keep him inside.

MOTHER: You are right. I must be more careful.

POLICEMAN: Well, my day's duty is almost ended. Tonight I must visit my father outside the city.

(Later. The policeman walks along a dark country road.)

POLICEMAN: It is dark out here, but the village is not far. I will keep to the side of the road. I will walk with my face toward the traffic. Then I can see any cars that come along. If they get too close I can step out of their way. . . Well, what's this?

(A man lies by the side of the road. He calls out in pain.)

MAN: Help me! I've been hit by a car.

POLICEMAN: Are you badly hurt? Any bones broken?

MAN: No, I don't think so. Help me stand up. Thank you.

POLICEMAN: Can you walk to the village?

MAN: Yes, if you will help me.

POLICEMEN: What happened?

MAN: A car hit me from behind. By good luck, it was not moving fast. However, it did not stop.

POLICEMAN: It is a crime not to stop. But you were also at fault. The driver could not see you. Your clothes are all dark. Your back was to the traffic. The driver could not see your face, which is light.

Always walk facing the traffic, especially at night.

MAN: Next time I'll know better! Let's go.

(The policeman helps the man walk slowly down the road to the village.)

FIGURE 10-1 CONT'D.

WAY No. 5

QUESTION & ANSWER

QUESTION: Why are our city streets dangerous?
ANSWER: They are full of fast-moving traffic. Modern traffic brings many accidents, even to those who walk.

QUESTION: Is it wise to walk in the middle of the street:
ANSWER: No, it is very dangerous. You may be knocked down.

QUESTION: Where should we walk?
ANSWER: You should walk on the sidewalk or the side of the road.

QUESTION: Which way should one look before crossing the street?
ANSWER: You should always look in both directions. Then cross the street when it is safe.

QUESTION: Why should we not run across the street?
ANSWER: A driver may not see you in time to stop. If you are caught in traffic, stop! Let the traffic go around you. When it is safe, continue quickly to the other side.

QUESTION: Why should we teach our children traffic safety?
ANSWER: Children usually are not careful. They play where traffic may hurt them. They must learn to stay on the road side. They must also learn to cross streets carefully.

QUESTION: Should babies be left alone near busy streets?
ANSWER: Very young children should never be left alone. They will often walk into traffic and be hurt.

QUESTION: At busy street corners what should we do?
ANSWER: Watch the policeman's signals or the traffic lights. Cross the street only when the signals say "Walk."

QUESTION: How should we walk on dark country roads?
ANSWER: Keep to the side of the road. Walk with your face to the traffic. Then you can see on-coming cars. You can step out of their way if necessary. Drivers can also see your face.

QUESTION: Why should we wear something light colored at night?
ANSWER: Because the drivers can see you better. Dark clothes are hard to see at night.

BE CAREFUL ON THE ROAD, DAY OR NIGHT!

FIGURE 10-1 CONT'D.

WAY No. 6
SAFETY RIMES

CROSSING THE STREETS

Look both ways before you cross
Or a car may throw you for a loss.

KEEP COOL

If you're caught out in the street,
Stop! Use your head and not your feet.

CHILDREN IN THE STREET

If the children use the streets to play,
They may get killed and laid away.

WATCH YOUR BABY

Keep your baby off the street
Or a car may knock him off his feet.

NIGHT WALKING

Face the traffic. Wear something white.
Keep to the road side. You're all right!

Rimes, while not directly translatable, can be adapted or devised in any language. They stick in the mind, especially when they are repeated in a number of different places, as on "spot announcements" on radio, in posters and in newspapers and other places. Rimes have a pleasant way of getting across many sorts of teaching lessons, which otherwise might go unheeded or unread.

Try a rime. It's worth your time!

11 PACKAGING AND REPACKAGING OF INFORMATION

11.1 OVERVIEW

> *PACKAGING of information is a physical recording, arrangement and presentation of information on a given medium and in a given form.*
>
> *REPACKAGING of information is rearrangement of physical media and/or forms in which information has been presented (or a presentation in a given medium and form of restructured information), which is tailored to the requirements of a specific clientele. The aim of repackaging is to enhance the acceptance and use of information products and the assimilation and recall of their contents.*

In packaging we make a distinction betweeen two related but still separate aspects:

> *PACKAGE MEDIA: the physical substance on which information is recorded, displayed, or presented.*
>
> *PACKAGE FORMATS: the arrangment, shape, and lay-out of information in a given product on a given medium.*

Strictly speaking packaging involves the symbols and signals representing information, and not information per se, however, for simplicity sake we talk about packaging of "information".

The way information is packaged cannot improve its content but it certainly can enhance its use, assimilation, and recall. True, a book should not be judged by its cover, but a well designed cover, attractive layout, appropriate format, legible print, presence of illustration... helps in a book's favorable reception and spread, as well as in reading, absorption, and recall of its contents. The package in which information appears is often a decisive factor in acceptance or rejection of the whole, even before the contents have been considered; and it certainly is a factor in the amount of use. The same content in different packages does receive different usage, does affect the rate of assimilation and does make recall dissimilar. Historically, this was understood very well from the time of antiquity.

But, it is most remarkable that so often the practices in packaging of information by modern information systems do not reflect such an understanding; the principles of good packaging are simply not being followed. Too often the products are illegible, unreadable, overcrowded, unattractive, unbalanced ... or plain ugly. The cost is cited as a major factor for such a situation; however, more often than not it costs the same to produce a well packaged product as a badly packaged one. In information services packaging and repackaging of information has not received the attention it deserves. This is true, be it in developed or developing countries. For instance, the number of articles on information packaging and repackaging in the literature of information science and librarianship is minuscule which reflects the amount of concern and work on the topic,

When it comes to packaging in information consolidation, the question:

How to package a product ?

should be extended to:

> How to package a product in a way that will enhance the use, assimilation and recall of its contents?

11.2 EFFECT OF TECHNOLOGIES

The ways and means of packaging information has always been affected by the technologies of the day and age. Moreover, they were affected in a revolutionary way when a number of differing technologies were successfully combined or integrated. Gutenberg united four technologies: printing press, printers' ink, paper, and movable type -- and the world has not been the same since. Without any one of these, printing could not have been possible. During the present age more new packaging technologies are being invented; old and new ones are being improved and combined in quantum jumps. Thus, the means and ways of packaging information are in a permanent state of far-reaching revolution.

Printing technologies, which predominated for half a millenium, underwent significant changes in the last 25 years, comparable to the change from the Wright brothers' plane to the spacecrafts. And new technologies came about to supplant and even challenge print: film, phonorecords, cassettes, ... and now the videotapes and videodiscs ... Furthermore, the computer and other electronic technologies have left their lasting imprint on information packaging.

But, the most revolutionary step is not in the quantum jumps within any one of these technologies, but in the combination and integration (through electronic technologies) of the means of production, processing and packaging information with those of its dissemination and display as exemplified by radio and tv broadcasting, online searching, satellite communication, teletext and videotext transmission, etc. These integrations are having a very significant effect on every aspect of information generation, processing and use. Consequently, they have a far-reaching impact (for better or worse) on our civilization, on the way we communicate and do things, and thence, on the way we live.

Because of these integrations,it is hard to really separate the media and forms for packaging and display of information from the channels for its dissemination. It may be more proper to talk in terms of media, forms and channels in information transfer.

Application and utilization of all these new and integrated information technologies are often very troublesome. At the root of the problem is not the complexity or cost of the technology itself, but something much deeper: the capacity and speed of the new technology to process, store, recall, transmit and display symbols and signals of information which far exceed the capacity of the human brain to process and assimilate information. The human brain has a limited capacity to process information (e.g. Miller's 'magical number' 7, represents the amount of information and the associated complexity that the brain can handle at any one time - see reference 2-2); the brain has a large, but still limited memory, and a high but still limited speed of information sensing, processing and subsequent reacting. For these reasons, there is worry about 'man-machine interface' and proper utilization of information technology in relation to humans, not machines. The fact is that we, the humans, have invented this new information technology, but as yet have not mastered its use. The problem is human, not technological.

In any case, information consolidation units have nowadays many more techniques to choose from than print for information packaging and dissemination. In given situations, media other than print may be more effective.

11.3 PACKAGING MEDIA

Selection of media for packaging in information consolidation should be user- and not media-oriented. In a user-oriented packaging, it is helpful to think first about human senses and then about media and forms. Human beings receive information through their senses. Thus, media for packaging of information should be considered in relation to the sense which will be involved. In the case of information consolidation, the sense most often involved is that of sight, less often the sense of hearing, even less that of touch (e.g. in training or demonstrations), and never the senses of smell and taste. Furthermore, the sense of sight involves reading and/or viewing, the sense of hearing listening and the sense of touch handling. Thus, the media of interest to information consolidation can be classified as pertaining to sight or hearing and sometimes touch or more precisely to reading, viewing, listening or handling, or any combination thereof.

The four basic classes of media (or, with subdivisions, eight media classes) in packaging of information are:

BASIC MEDIA IN INFORMATION PACKAGING

1. *Print, subdivided into:*
    1a. *Print-hard copy*
    1b. *Print-microimage (micrographic copy)*
2. *Audiovisual media, subdivided into:*
    2a. *Visual media - still images*

BASIC MEDIA IN INFORMATION PACKAGING CONT'D.:

- 2b. *Visual media - moving images*
- 2c. *Audio media*
- 2d. *Any combination of the three*

3. *Electronic media*
4. *Interpersonal contacts (as a medium)*

As mentioned, these basic media can each stand by itself, or they can come in various combinations with one another. In such combinations, they become interdependent and even undistinguishable. The combinations of media can create a distinct medium of its own, as is the case of audiovisuals where the audio and the video aspects are combined. In other words, the classification of media is not neat with mutually exclusive classes.

Furthermore, it is quite obvious that within each of the basic classes or subclasses there are a great many further subdivisions possible until we get to each individual medium that exists. In the framework of this Handbook we cannot provide such an exhaustive survey, however, we do give specific examples where appropriate in this chapter and in Chapter 5 on information consolidation products.

1. Print-hard copy. Print on paper is still by far the most widely applied medium in information systems and services. There are other media that are seriously challenging the print predominance (11- 8), but despite many pronouncements,the print will remain basic to the world's civilization for a long, long time. Furthermore, print is basic to some other media e.g. for microimages (microfilm, microfiche) one first has to have a print-hard copy; movies are made starting with a printed script: many end-products of electronic media are print, such as computer printouts.

After all, a book, a journal, a report is an extremely effective information transfer device. A book (report, article...) is used 'online' and can be used in a 'random access manner'; it is highly portable; it is usable under many conditions (e.g. it can be taken to bed); it is produced at a relatively low cost; it stood the test of time; and it is thoroughly incorporated in our civilization.

The number of technologies available for the production and reproduction of print are constantly proliferating: from movable type printing presses to offset printing, from typewriters to word processing terminals, from mimeographic machines to reprographic (Xerox) copy machines, and so forth.

As a result, it was never as easy as it is now to produce or copy a mass of printed materials. It may even be too easy. The economy of scale is working as well: devices for printing and/or copying that produce a high quality product or copy can be obtained at a relatively low cost. (However, it is not only the initial cost that should be considered,but also two other most important aspects: (i) operating costs and (ii) likely maintenance costs)

An overwhelming majority of 'living' examples of information consolidation products that the authors have been able to procure or get a description of are print-hard copy products. So far,the other media have simply not penetrated to any noticeable extent the practices of information consolidation. Even though there are some examples of application of other media, they are the exceptions and not the rule. Why is this so? Speculatively, it probably has to do with the restrictive training (and thus thinking) of information professionals which is mostly oriented towards print as a medium for information transfer.

1b. Print-microimage. This refers to microfilms, microcards, microfiche, and microtexts, often called micrographics for short. Micrographics are increasingly being used in a great many situations (11-6). The obvious advantages of micrographics are:

- tremendous saving of space in storage.
- possibility to have a wide distribution of documents (books, blueprints, reports) for which there is a limited number of original print copies available.
- low cost of reproduction once made (e.g. the cost of a microfiche of a report is much less than that of its printed copy.
- easy "on the spot" reproduction (e.g. a microfiche, which has possibly 50 or more pages, can be reproduced on a Xerox-like machine at the same speed and cost as a Xerox copy of a printed page).
- low cost of mailing, in comparison to the mailing cost of printed copy (e.g. it is cheaper to mail a microfiche overseas at an airmail first class rate than the printed report at a printed matter third class rate).

The obvious disadvantages are:

- micrographics cannot be read, perused, scanned with the naked eye as a print-hard copy can.
- technology for viewing and reading of micrographics is cumbersome and still not very good; furthermore, viewers are not widely available.
- there are many noncompatible micrographic technologies; one cannot use certain technologies in conjunction with certain others.
- the technology and process used in making the original micrographic image from print is cumbersome, costly, and complex.

Despite many advantages, the disadvantages are still such that there is a restricted use of micrographics in information consolidation. Even with the advances of Computer-Output-Microfilm (COM), the situation does not seem to be changing. The greatest use of micrographics is in relation to the storing of reports, catalogs, manuals, blueprints, data, etc. which are otherwise bulky, but not often used or are used only in reference to retrieval of certain pages, data or items only and not for reading of the whole thing. For manuals or data, micrographics should be considered for some information consolidation products that fall into that category.

2a. Visual media-still images. This involves pictures, and illustrations ... drawings, graphs, and charts ... transparencies and slides ... filmstrips and filmloops ... and a great number of other visual artifacts. Their use as or in information consolidation products can be very effective: a picture is often worth a thousand words.

Some of the still images can be viewed without any help of a device. Others need a device to be seen: slide projectors, overhead projectors, filmstrip projectors, etc. A whole viewing technology exists for different types of still images. In general, this viewing technology is simpler and less costly than the viewing technology for moving images. The still images are less complicated and less expensive to produce.

For these reasons, pictures, illustrations, slides ... or still images in short, should receive serious consideration in the packaging of information consolidation products.

2b. Visual media-moving images. This involves films of late videotapes and of very late videodiscs. Any of these can, of course, be combined with an audio channel (or channels) and most often they are. In other words, silent films still exist and are produced; they can be effective for various purposes, such as demonstration or illustration, but they are getting to be rare. All of the moving image media involve relatively expensive and complex technologies for production and for projection. But, if a picture is worth a thousand words, a moving picture is worth ten thousand. With increased cost and complexity can also come increased effectiveness.

Film as a medium is quite well known and widespread. We shall discuss here only the lesser known media: (i) videotapes and (ii) videodiscs, because of their great potential for information consolidation. Videotapes are used in connection with television: a tape is in a cassette and a videotape player is used to show the pictures and sound directly on a given television set or to send it through a television station. Videotape players are highly portable, thus they can be used anyplace in conjunction with a television set. Videotapes are not that expensive to produce or purchase. Videotapes have an advantage over films as they can be played back after being recorded without any film processing. As a matter of fact, they can be played right away (they are used as such in training). Most videotapes have two audio channels. One channel can be used for one language (let us say English) and the other is available to record a translation into another language (let us say Swahili). Thus, a master tape in one language can easily be reproduced with translations into any language as necessary. These are great advantages to be considered for information consolidation products.

Videodiscs are the newest and quite revolutionary medium that came along just recently. They look like large phonodiscs and are shown through a player on television or on cathode ray tube terminals. Two types emerged: laser videodiscs ('read' back by a laser beam that does not physically touch the grooves on the disc) and capacitance videodiscs ('read' back by a stylus that touches the grooves as in a phonorecord). The two technologies are not compatible - one type of videodisc cannot be played on the other's equipment. Capacitance videodiscs wear out as a phonorecord, the laser ones do not.

The capacitance videodiscs and technology is cheaper, but the laser videodiscs and technology is much more versatile and less sensitive to things like dirt particles on the disc. Laser videodiscs can have recorded on them: still images (picture by picture, blueprint by blueprint) or moving images (a film), sound plus an index to each frame that allows direct access to any frame as desired (a videodisc can typically have about 50,000 frames on one side). Each videodisc can be played forward, and backward for replay; any picture can stand still and be advanced as in a slide projector: the pictures can be slow moving: or the jump can be made to any frame (as indexed) backwards or forwards. Blueprints and documents can be stored on videodiscs without sound or with sound offering explanation: this can be followed by a film, a text, or a page of instructions. Training packages have been produced on videodiscs which contain a film, slides, written material, exams, self instructing steps going backwards and forwards, etc. These have proven to be the best self-training packages yet produced. The disadvantage of videodiscs is that they cannot be erased as videotapes and used over again, they cannot be produced as easily and by amateur-run equipment as films and videotapes; they are more expensive to produce and the play-back technology is more expensive to acquire and maintain.

Nevertheless, these new video media have a lot to offer in packaging of information consolidation products, particularly if the videotapes or videodiscs are produced at some large and advanced information system for a wide distribution and repeated viewing, with the possibility to superimpose translation in various languages as necessary.

2c. Audio media. Here we shall discuss the media that are solely devoted to hearing. Those that are devoted to hearing in conjunction with viewing we already discussed. These include: phonorecords, tapes, and cassettes. Each has a number of types and separate noncompatible technologies for play back, although they can be produced and recorded in conjunction with one another.

Phonographs need separate technologies for recording and for play back. Cassettes and tapes do not: the same device can be used for both. Phonographs cannot be reused for recording, cassettes and tapes can be used over and over. Cassettes and tapes are more expensive. In comparison to tapes and tape technology, cassettes are smaller and of lesser bulk, less messy to use, more portable, and less expensive.

Thus, cassettes have emerged as a medium of great promise when recording of sound is considered, either by itself or in conjunction with still images (slides, film-strips). Presentations involving combination of slides or filmstrips and cassettes proved to be very effective. Moreover, the technology needed for playback is relatively simple and inexpensive.

3. Electronic media. As mentioned earlier, the present day revolutionary integration of the ways and means of production, processing and packaging of information, with those of its dissemination and display is due to the advances in electronic technologies: computing, telecommunications and broadcasting. Each of these technologies also evolved a myriad of peripherals which greatly extend the working domain and applications, and moreover which allow for interconnections among the various electronic technologies (e.g. computing and telecommunications) and between electronic and other media involved in information transfer.

Electronic technology also has its own media for display which has no connections at all with print or other media. For instance, soft image displays on cathode ray tubes and audio synthesizers. The storage media are also unique: computer memories, tapes, discs, drums, magnetic cards, etc. Some of the electronic media and technologies have already proved to be of great practical use and effectiveness in information consolidation, most notably the online data bases, other electronic media and technologies, just maturing (most notably, teletext and videotext)may have an even greater potential in the future. Let us discuss these three. Online data base media and technology consist of: (i) a data base (an organized file of information in a computer) or a number of data bases in different subjects, (ii) a computer that manipulates the data base as instructed, (iii) a telecommunication network between the computer and user (e.g. a telephone line) and (iv) a terminal (print or cathode ray tube) at the user end. The data bases started in the late 1960's as a mirror image of printed indexes and the searching of data base was close to the searching of printed indexes; the greatest refinement and improvement being in the ability to combine terms. However, by 1980,the data bases were not any more mirror images of print indexes: structures became different; data bases had information values added; access points have multiplied, etc. Besides, a number of data bases have no printed counterpart, they appear in computer form only,and accordingly are adjusted to computer form and searching. Moreover, searching changed as a result, but most significantly manipulations of output became possible,to create formats, tabulations or even calculations after the retrieval, as desired by user. Different formats, cross tabulations, statistical correlations, time series, reduced outputs ... are created after retrieval of information from a data base; these were not in the data base, but these were done in direct conjunction with searching. Manipulations were introduced that were never dreamed of before in conjunction with printed indexes or any printed texts. Consolidated information products can now be produced directly from searching of data bases as shown in examples of Section 11.5. But, like everything else there is a catch. First, one has to have access to proper data bases; in many developing countries this is certainly possible, but not economically feasible or politically allowable, primarily because of unresolved issues of transborder data flow. Second, one has to know much more than just online searching, i.e. in addition one has to have the know-how of manipulation capabilities and techniques (e.g. if statistical manipulations are involved, this also means knowledge of which statistical techniques to select and of their meaning); unfortunately, not many online searchers anywhere have yet acquired this manipulative know-how. Nevertheless, these online manipulative capabilities should not go unnoticed when considering information consolidation in developing countries.

Teletext and videotext are an entirely different proposition: both involve TV or video terminals. Teletext is broadcasting of text through television channels; 'pages' of text are broadcast through air or cable by a station; a specially added decoder on a TV set enables the display of a 'page' with or without the regular picture. Videotext is a connection of a computer data base (or many data bases) through a telephone line to a calculator-like pad and to a decoder on a TV set which enables the display as well as selection of contents of data bases available. Videotext is interactive, teletext is not e.g. teletext will display the latest airline schedule but videotext can also enable a viewer to make a reservation on a desired flight. The important aspect in both of these is television: the domestic TV set is now also becoming an information tool, not just a passive viewing box. Since television is widespread,the uses of teletext and videotext can become as widespread. The governments in Germany, France, Great Britain, Sweden, Canada, Japan, the Netherlands, Denmark, and some other countries have become very interested and have invested great amounts of money and effort to develop and operationally test various teletext or videotext networks. At present,the U.S. is lagging behind in these applications, but a number of communities and private companies have been conducting experiments. National libraries and various information centers have been heavily engaged in these experiments, particularly in Canada and Great Britain. In a way, information consolidation is part and parcel of services provided through teletext and videotext. The potential for information consolidation is great, but as yet the whole area is still in a volatile experimental stage (11- 7, 11-13).

4. Interpersonal contact. As already mentioned, one of the revolutionary steps in our time is the combination and integration in some media (particularly through electronic technology) of the means and ways for processing, storing and packaging information with those for its dissemination and display. In people these functions were always combined. Thus, it is hard to think of interpersonal contact (or people) as "just" a medium for information processing and packaging or "just" a medium for dissemination, although at times one of these functions may predominate. For our purpose, the most appropriate attitude is to think of interpersonal contact in terms of information transfer, as mentioned before.

People with a variety of backgrounds and functions can serve as a media in the transfer of consolidated information:

* subject specialists (engineers, scientists, technicians, etc.)
* information specialists (information scientists, librarians, etc.)
* change agents (extension workers, health center workers, etc.)

- pre-professionals (barefoot doctors, technical assistants)
- information gatekeepers (early adaptors of an innovation, key organizational personnel as to information)
- authority figures (opinion leaders, organizational or unit heads, respected persons, etc.)

These people can act in the information transfer functions in the role of:

- lecturers
- demonstrators
- trainers
- problem-solvers (question-answerers)
- evaluators, reinforcement agents
- any combination of the above

In the interpersonal contact,any other media can be used as reinforcement and,vice versa,the interpersonal contact can reinforce the use of other media. These combinations can work extremely well.

The effectiveness of interpersonal contact as a medium in the transfer of consolidated information depends on:

- careful selection of the type of person(as to the background and function)to match and/or appeal to the audience and as to the ability to project
- careful determination of the transfer function(s) in which the person will play a role
- training of the person for that role
- attention to form of transfer

Interpersonal contact is naturally restricted to the number of people that can be reached at any one time. It is not suitable for mass information transfer. It is also restricted in another sense: it is hard to find and train people to engage in interpersonal contact for information transfer. However, in a great many situations nothing can beat a person to person contact.

11.4 PACKAGING FORMATS

As mentioned, format refers to the arrangement, shape, and lay-out of information in a given product on a given medium. The human brain processes information and affects cognition and comprehension,among others,by association. Significantly, the rate of the brain's information processing, the cognition, comprehension and associations can be improved by appropriate formats geared to the human brain.

In a practical sense, this means that a user can be guided, reinforced, rewarded, or warned by embellishing symbols, by enriching the meaning of symbols, by full typographical presentation, by selected use of graphics and illustration, by colors, by mnemonics... It is important to think of format in terms of aesthetics, but in information consolidation, (and in all information services) it is much more important to think of format in terms of the capabilities of the human brain. A format does affect the effectiveness of information transfer.

Specific formats are dependent on the specific medium used in a given product; however, some principles of effective formating (in the above sense of enhancement of human information processing, cognition, comprehension, and association) are valid for any number of media. Among these are:

PRINCIPLES OF EFFECTIVE FORMATTING:

1. *Readability*: *(comprehension where reading is involved.)*
2. *Viewability*: *(comprehension where viewing is involved.)*
3. *Audibility*: *(comprehension where listening is involved.)*

PRINCIPLES OF
EFFECTIVE FORMATING
CONT'D.:

4. *Identifiability* (*cognition and perception of key informational elements*)
5. *Mnemonics* (*visual or audio association*)

1. Readability: Everybody knows that when a product is hard to read in in the first place, the likelihood of its acceptance, use and assimilation diminishes drastically. Yet, how often is each of us confronted with products whose typography is too small or too light, that are crowded or shown together... i.e. generally unreadable? To improve comprehension through reading:

* use as heavy a type as available
* use contrasting type in relation to the color of the paper
* use an attractive, pleasing layout
* use sufficient margins and space around text
* do not crowd a page with too many lines and words
* break up long paragraphs, long sections, long chapters
* match the margins, words on each page and paragraph lengths to the reading level of the public e.g. the lower the reading level, the wider the margin, the fewer words and paragraphs per page
* use titles and subtitles wherever possible and necessary, but do not use a subtitle for its own sake
* separate titles and subtitles from the text
* use graphics, illustrations, charts, but only in clear relation to the text, and integrated with the text
* place graphics, illustrations, charts close to where discussed in the text
* number all pages

2. Viewability. It is also crystal clear to everyone that in order to be correctly assimilated,still and moving images have to be clearly seen. Yet, how often was each of us at a meeting where slides were illegible? Or was confronted with situations where what should be viewed was presented was undecipherable? To improve viewing comprehension:

- * on slides and transparencies: use a very limited number of words per slide; use large typography (as a rule regular typewriter size letter is too small); test
- * if projected on a screen,watch for the relation between the size of the hall and the size of the screen; test
- * use color in pictures, graphs, illustrations, wherever possible
- * use comic strips or cartoon illustrations where possible
- * do not clutter illustrations, charts; do not make them too complex - complex charts will not be followed
- * in pictures (still and moving) make the objects fully recognizable and contrasts, borderlines fully distinguishable
- * watch for the loss of the third dimension; use angles if possible, to gain the impression of all dimensions
- * watch for the loss of the feeling for scale or size of things; use comparative objects to illustrate scale.

3. Audibility. To be heard and assimilated,the sound has to be not only loud, but it has to have a modality, rhythm, and expression that is adjusted to the comprehension of an audience. To improve audio comprehension:

- * make the sound level appropriate to the size of the hall or enclosure; test
- * in speeches, lectures, explanations, watch for proper modulations and rhythm; do not talk flat and/or fast

- in prerecorded explanations or messages, if possible, use speakers with professional speech training (including actors, newscasters)
- in cases where video and audio are presented simultaneously, watch for synchronizations; test
- in cases where audio alone is presented,watch for the loss of visual dimensions; compensate accordingly, possibly with sound effects other than speech;
- use music where possible.

4. Identifiability. This refers to signals other than words (written or spoken) and illustrations that help the cognition by drawing the attention of a reader (viewer, listener) to the key elements of content, major points made, summaries, changes in emphasis or topic, etc. The identifiers also assist in making associations within the text (or materials presented). Such identifyers are of great importance as they can assume a meaning of their own, they can modify the tone of information and affect perceptions and associtation, as shown by numerous psychological and brain research studies. They also add to the aesthetic value of an information product. In information consolidation,identifiers can be extremely effective and should be planned carefully and used extensively. The following practices have proved their value

- whenever available,use different typography, as to type, boldness and size, for titles, subtitles, key phrases, summary paragraphs, short explanations and important parts of illustrations. Use typography so that it stands out. Even many typewriters have the capability to use different scripts, so,if acquiring a typewriter,get one with such capabilities
- underline or capitalize key phrases, if different typography is not used. But, be careful, do not overindulge in underlining and capitalizing, as it looses it characteristic as an attention getter

* use border lines, enclosures, separation from the rest of the text, for key paragraphs or concepts
* vary the margins for enumerations and subordinate portions of the text
* use typographical symbols (such as *, +, ...) to set up a beginning of a key phrase or to break up long enumerations
* use different colors where possible, to make key elements of text and illustration stand out
* intersperse graphic design symbols (vignettes,geometric patterns, etc.) through a text or illustration. Break up monotony
* use graphic layout to accentuate the important portions of the text. Watch that break-up of pages or drawings does not occur at inappropriate places
* in audio recordings: use stronger or different voice to underline key phrases. Use pauses to separate paragraphs. Use sound effects for such purposes
* in interpersonal contact,use gestures and animation, pauses, and facial expressions to call attention to important aspects of a presentation. Read a book (or take training) on effective speech-making, lecturing and/or personal communication
* try to employ (or train) a person with graphic arts background to help with layout of texts and use of identifyers
* use identifyers consistently throughout the text, illustration, or speech, so that the users are always alerted to the same things when they see (or hear) the same identifyer
* do not overdo it so that identifyers loose meaning and become a distraction rather than an attention getter.

5. Mnemonics. These are used similarly as identifyers, and some authors do not even make a distinction between identifyers and mnemonics, calling them all together view-(or audio-) mnemonics. However, the prime use of mnemonics is to assist in recall of previously encountered information and in eliciting associations among different texts or previous parts of the text. The human brain has the capability to recall or search for information by associating information with color, physical location, size, and other physical attributes of the objects containing information. (E.g. "It is the red book [folder...] way on top of the shelf"). The human brain makes associations, some of which may be predictable, others may not. Mnemonics makes use of such associative and recalling capabilities of the human brain. Some of the mnemonics have achieved universal meaning, e.g. red sign or signal in many countries is associated with danger or stop. Companies, organizations, institutions have long recognized the importance of having their products, reports, monographs, pronouncements, etc. immediately recognized and associated with them. Thus, they developed distinct logos, symbols, colors, lettering styles, and the like that draw immediate associations with the organization. These mnemonics stand for identity and have achieved through usage a meaning of their own. Mnemonics have an important associative and recalling function to play in information consolidation products. For instance:

* use a well identifiable logo on your information consolidation products
* develop identifiable symbols or designs to stand for different types of products
* use the same color of association among similar products or between related portions of the same product
* use different colors and/or different paper in the same product to

differentiate between different portions and to make it easier to immediately access desired information (e.g. use "blue sheets" as a recall for a certain type of summary, drawings, instructions)

* use heavier paper to separate portions of a text for easy access
* use markers which protrude from the rest of the text
* use identifiable persons or characters in comic or cartoon strip style to stand for a given concept or action (e.g. invent "Maestro Juan" as a wise man who demonstrates and applies proper construction techniques and shows what is wrong with nonproper techniques)
* use illustrations and graphic arts designs to convey a message (e.g. a smiling versus a sad face, a puzzle with different missing portions at different parts of a text)
* in interpersonal contact,use breaks, fables, lunches...in association with information conveyed
* use symbols and symbolism for abstract concepts
* be consistent in the use of mnemonics. Do not overdo it; otherwise it would disperse rather than create associations.

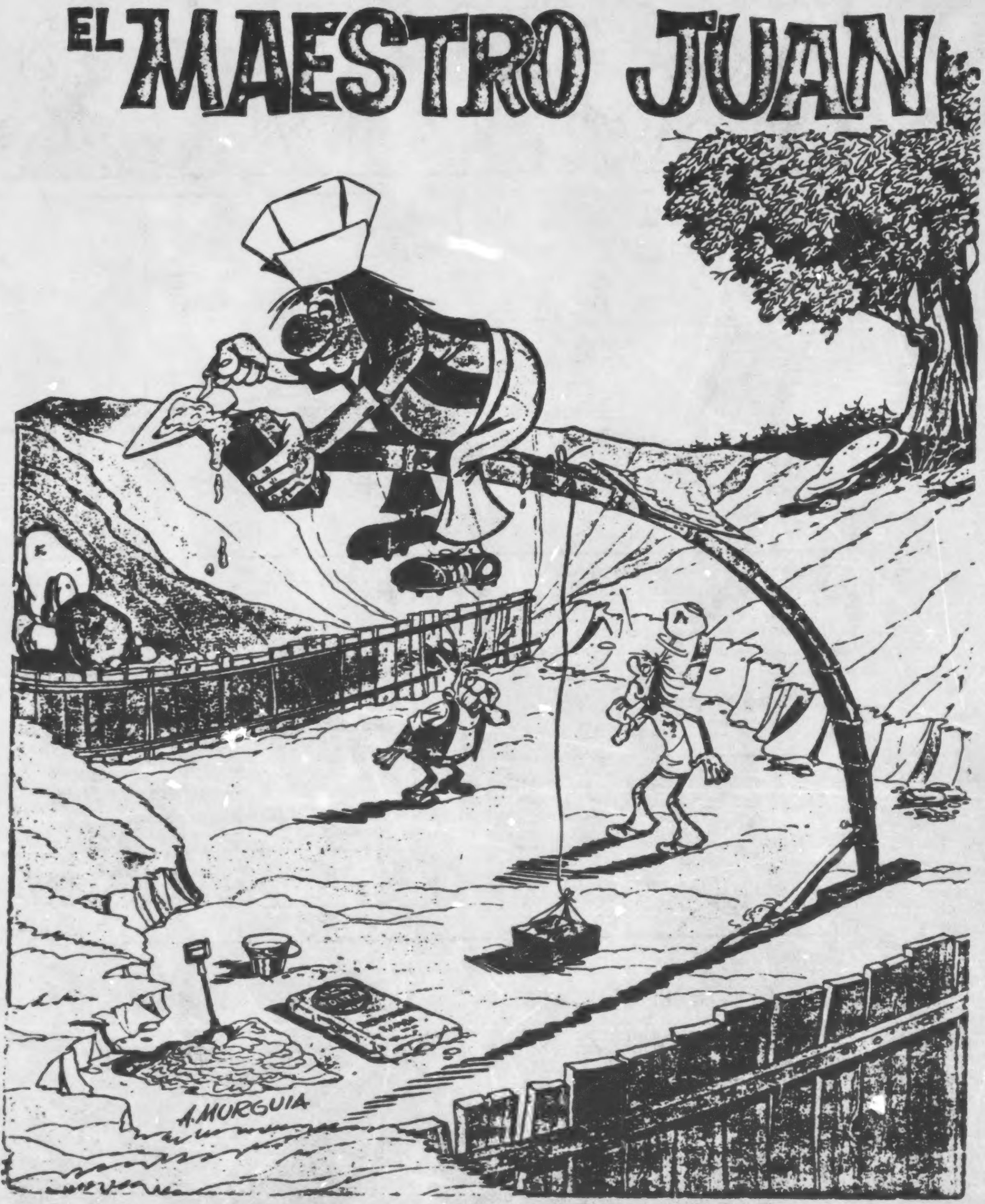
11.5 FOUR EXAMPLES

11.5.1 COMIC STRIP

An ingenious way for information transfer is employed by Tolteca, a cement producing and distributing company in Mexico. Tolteca has invented Maestro Juan, a master craftsman, who shows others, through many trials and tribulations,how to correctly mix mortar and cement for various uses, how to apply it for various purposes, how to test the applications, how to use the equipment, etc. There are amusing situations and problems, careless characters, and many life complications as in any proper strip, but also clear solutions, diagrams and directions. The title page of a booklet is shown in Figure 11-1 and one of the inside pages in Figure 11-2.

(For further information contact: Cementos Tolteca, Av. Tolteca 203 San Pedro, De Los Pinos, Mexico 18, D.F., Mexico).

FIGURE 11-1: TITLE PAGE OF THE INSTRUCTIONAL BOOKLET AS COMIC STRIP ON USE OF CEMENT FROM MEXICO. (THE BOOKLET IS IN COLOR WHICH CANNOT BE REPRODUCED IN THIS HANDBOOK.)



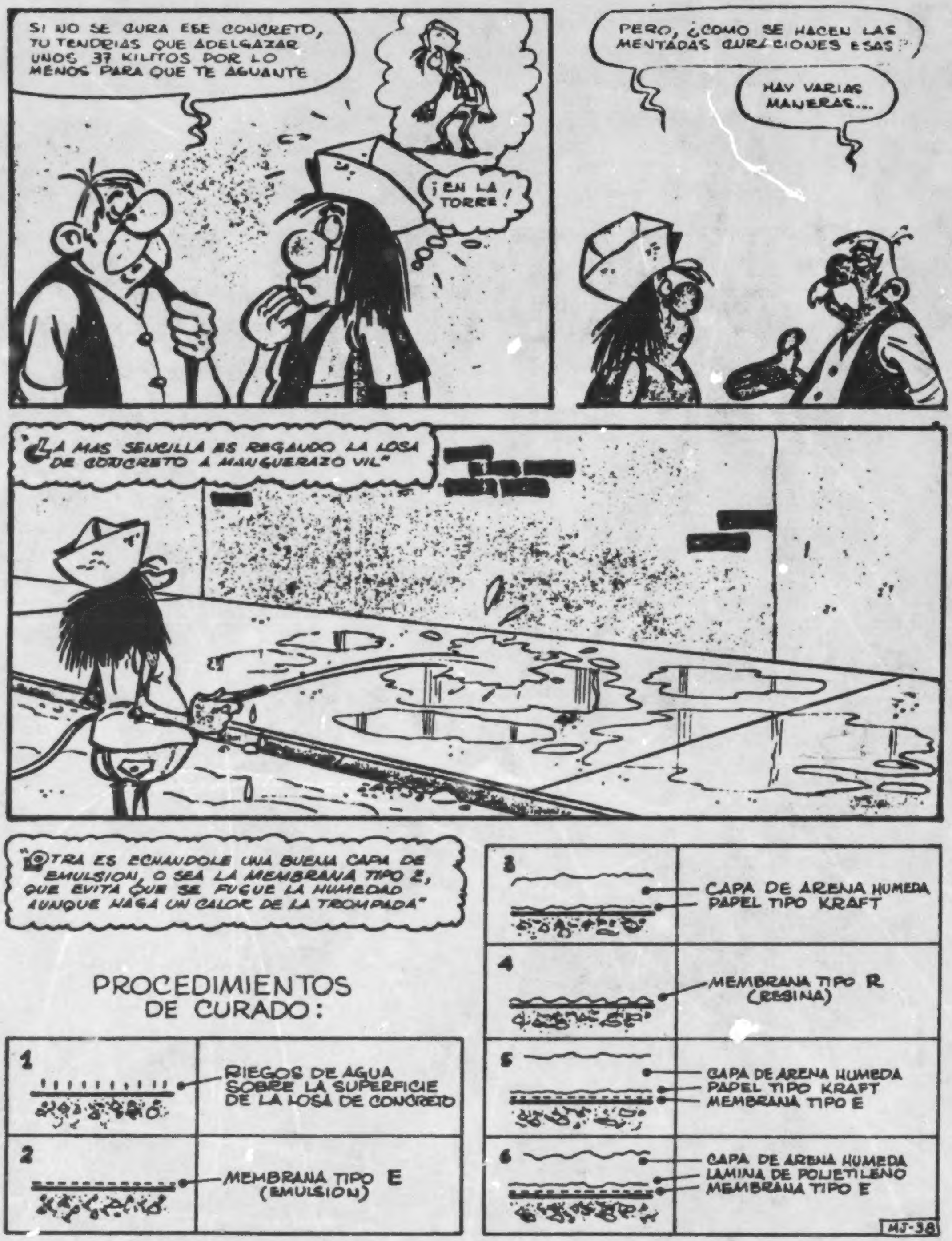

SI NO SE CURA ESE CONCRETO, TU TENDRIAS QUE ADELGAZAR UNOS 37 KILITOS POR LO MENOS PARA QUE TE AGUANTE
¡EN LA TORRE!
PERO, ¿COMO SE HACEN LAS MENTADAS CURACIONES ESAS?
HAY VARIAS MANERAS...
"LA MAS SENCILLA ES REGANDO LA LOSA DE CONCRETO A MANGUERAZO VIL"
"OTRA ES ECHANDOLE UNA BUENA CAPA DE EMULSION, O SEA LA MEMBRANA TIPO E, QUE EVITA QUE SE FUGUE LA HUMEDAD AUNQUE HAGA UN CALOR DE LA TROMPADA"
PROCEDIMIENTOS DE CURADO:
1
RIEGOS DE AGUA SOBRE LA SUPERFICIE DE LA LOSA DE CONCRETO
2
MEMBRANA TIPO E (EMULSION)
3
CAPA DE ARENA HUMEDA
PAPEL TIPO KRAFT
4
MEMBRANA TIPO R (RESINA)
5
CAPA DE ARENA HUMEDA
PAPEL TIPO KRAFT
MEMBRANA TIPO E
6
CAPA DE ARENA HUMEDA
LAMINA DE POLIETILENO
MEMBRANA TIPO E
MJ-38

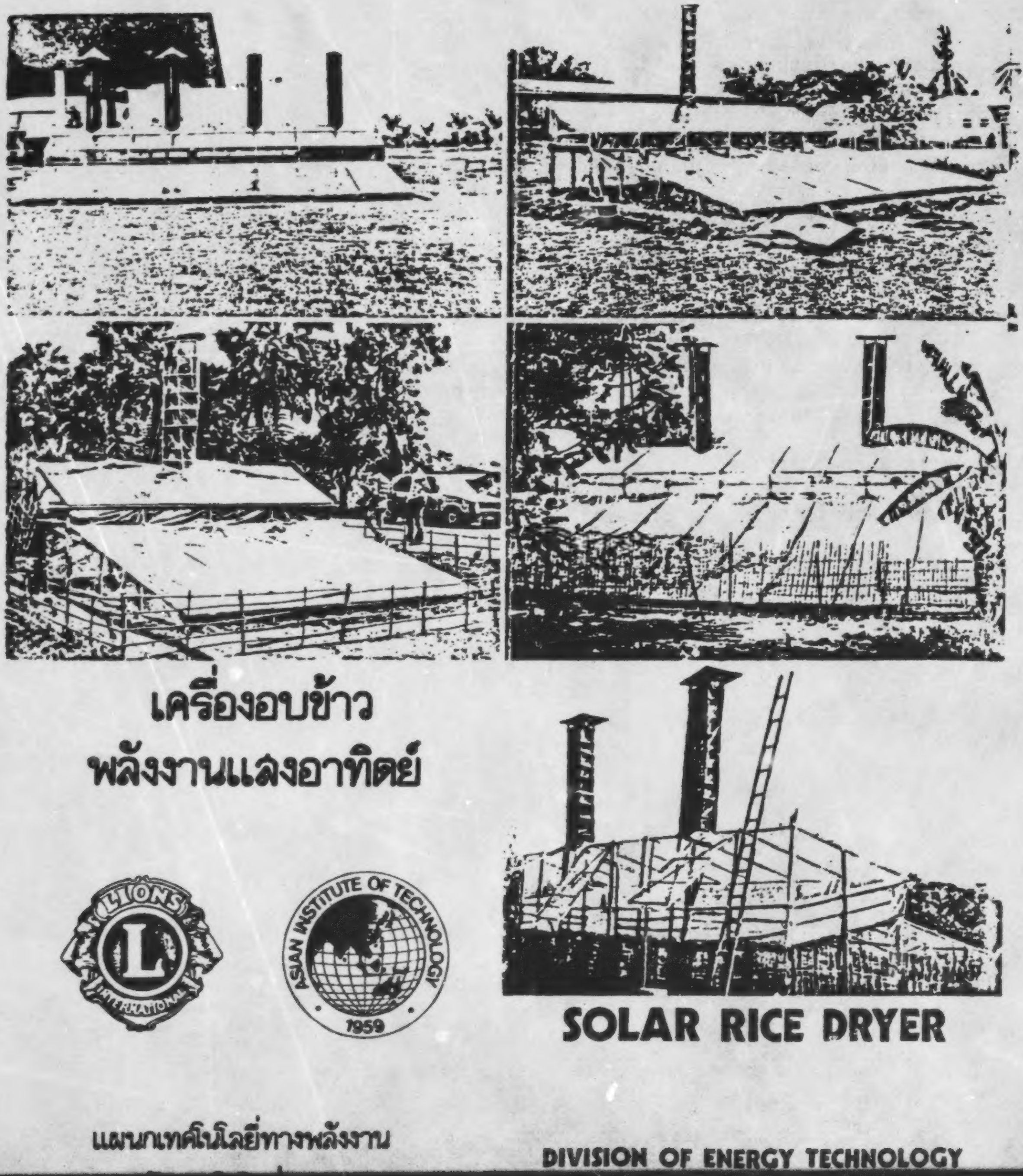
FIGURE 11-2: A PAGE FROM THE INSTRUCTIONAL BOOKLET - COMIC STRIPS ON USE OF CEMENT FROM MEXICO. (THE PAGE IS IN COLOR WHICH CANNOT BE REPRODUCED IN THIS *HANDBOOK*.)

11.5.2 PAMPHLET

The Renewable Energy Resources Information Center of the Asian Institute of Technology (described in Appendix) produces many pamphlets for use by farmers, rice growers, etc. These describe simple devices or structures that can be constructed with domestic or easily obtained materials and with domestic labor. The example presented here is a fold-out pamphlet in two languages: English and Thai on a solar rice dryer. The pamphlet contains pictures and diagrams. Figure 11-3 shows the title pages of the pamphlet, the one in English on the one side, and Thai on the other side of the pamphlet. Figure 11-4 shows the inside of the pamphlet. Unfortunately, the Xerox copy was not capable of picking up the colors and worse; the details,of a drawing which is in blue. By itself,this failure to reproduce a particular color is our example of a reprographic medium which is inappropriate.

(For more information contact: Renewable Energy Resources Information Center, Asian Institute for Technology, P.O. Box 2754, Bangkok, Thailand)

FIGURE 11-3: TITLE PAGES OF A FOLD-OUT PAMPHLET IN TWO LANGUAGES ON AN INEXPENSIVE PROJECT. (COLORS CANNOT BE REPRODUCED IN THIS HANDBOOK)



เครื่องอบข้าว
พลังงานแสงอาทิตย์

LIONS INTERNATIONAL

ASIAN INSTITUTE OF TECHNOLOGY
1959

SOLAR RICE DRYER

แผนกเทคโนโลยี่ทางพลังงาน

DIVISION OF ENERGY TECHNOLOGY

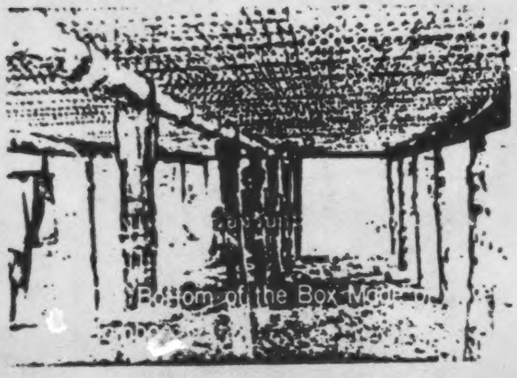
FIGURE 11-4: INSIDE OF A PAMPHLET ON SOLAR RICE DRAWING FROM THAILAND. (THE PAGE USES COLOR WHICH CANNOT BE REPRODUCED FOR THIS HANDBOOK.)

(IN THIS SPACE THERE IS A DRAWING ON A BLUE BACKGROUND WHICH DOES NOT REPRODUCE ON XEROX)

eeps out rain. The cross-section of the chimney is n equilateral triangle whose side is 50 centimetres.

There should be no air leaks in the plastic cover ver the dryer. Leaks will reduce the efficiency of ying.

The newly threshed paddy should first be cleaned o remove straw and chaff. It is then loaded into the ox to make a layer not more than 15 centimetres eep. If the rice bed is deeper than 15 centimetres it ill not dry because not enough air will flow through . The paddy will dry better if it is stirred several imes during the day.


Bottom of the Box Mod

The time taken for the paddy to dry depends on the depth of the bed, the initial moisture content of the paddy, and the weather. If the paddy has already become partly dried during threshing and the weather is fine, drying will take one day. If the initial moisture content of the paddy is high and the weather is cloudy, drying may take a few days.

Even in dull weather the air inside the dryer will be warmer than the outside air, and slow drying will take place. During periods of rain the paddy in the dryer is safe and will not be spoiled.

The cost of a dryer for a batch of 800 kilograms of paddy was 2,382 bahts (October 1979). If a farmer has his own bamboos then he has to pay only 900 bahts for the other materials.

ปัจจุบันเกษตรกรไทยได้หันมาปลูกข้าวนาปรังกันมากขึ้นเพราะได้ผลผลิตสูง แต่การเก็บเกี่ยวข้าวนาปรัง ส่วนใหญ่จะอยู่ในช่วงฤดูฝน ข้าวที่เปียกฝนถ้าทิ้งไว้นานเกินไป ข้าวจะงอก เกิดเชื้อรา และข้าวจะเป็นฟันหนู เกษตรกรส่วนใหญ่ต้องรีบขายข้าว ที่เปียกฝนไปในราคาต่ำนับเป็นการสูญเสียของเกษตรกรที่น่าเสียดายยิ่ง

เพื่อแก้ไขปัญหาการสูญเสียของเกษตรกร เนื่องจากข้าวเปียกฝน ทางสถาบันเทคโนโลยีแห่งเอเซีย จึงได้ออกแบบ ทดลอง และพัฒนาเครื่องอบข้าวด้วยพลังงานแสงอาทิตย์ เครื่องอบข้าวนี้เป็นเครื่องอบแบบง่ายๆใช้วัสดุตามท้องถิ่นเป็นส่วนใหญ่ เกษตรกรสามารถทำเองได้ พลังงานที่ใช้จะได้จากแสงแดดและก้อนเมฆเท่านั้น ไม่ต้องใช้น้ำมันหรือไฟฟ้า หรือเชื้อเพลิงอื่นใดอีกเลย สามารถอบข้าวให้แห้งได้ภายใน ๑-๒ วัน กันฝนได้ และข้าวเปลือกที่ผ่าน การอบด้วยเครื่องอบนี้แล้ว จะมีคุณภาพการขัดสีดีกว่า ที่ตากแดดธรรมดา นอกจากนี้เครื่องอบยังสามารถนำไปใช้อบผลิตผลทางเกษตรอื่นๆ เช่น ข้าวโพด กล้วย ถั่ว มะพร้าว ปลา เป็นต้น

เครื่องอบข้าวจะประกอบด้วยส่วนที่สำคัญ ๓ ส่วน คือ

๑. แผงรั
สีดำ (หรือวัสดุ
เกลี่ยบนพื้นดิน
สีดำทั้งด้านบน
ซึ่งเปิดไว้เพื่อใ

๒. กะบะ
ตาข่ายในล่อนด
ไม้ไผ่สานแทนก็
แข็ง ตัวกะบะ
ได้) หลังคากะ
ใสทั้งหมด และ
หลัง

๓. ปล่อง
พลาสติกสีดำติ

เครื่องอบข้
แสงแดดและรัง
แผงรับแสงจะเ
ร้อนนี้จะลอยตัว
ทางด้านล่างขึ้น
ขึ้นบนในกะบะจ
ล่าง พลังงานที่

11.5.3 MARKET DATA

This example shows the ability to produce custom-tailored market reports directly while interacting with an online data base. Economic Information Systems - Business Information Systems [EBIS] (of Control Data Minneapolis, Minnesota, U.S.A.) available on a network called CYBERNET, provides data on some 225,000 business firms and markets in the U.S. and other countries. One can retrieve data and arrange reports on four aspects: (i) share-of-market (who produces how much in a given product line); (ii) line-of-business (on competitive comparisons to analyze the operations and patterns of diversification of various firms); (iii) state market size (in given products in each U.S. state and a number of other countries); and (iv) industry by industry county markets and firms in all U.S. counties (includes number of employees and size of each industry).

The reports are a tool in market, economic, and industry analysis, sales strategies, planning, diversification, etc. The industries and their products are classified according to SIC (Standard Industrial Classification), which is a comprehensive, well known classification in industry. The population data are based on official census reports.

Figure 11-5 shows a computer-produced report on a request for market information on one company in the U.S.

Figure 11-6 shows a report on one industry.

Figure 11-7 shows analysis of two industries, by geography in three countries in the state of Minnesota; from this report one can jump and get a report on individual companies, or a class of companies.

(For more information contact: Economic Information Systems, Inc., Control Data, P.O. Box O, Minneapolis, Minnesota, 55440, U.S.A.).

FIGURE 11-5, MARKET REPORT ON ONE COMPANY: CARRIER CORPORATION.

```
◆

EBIS GENERAL COMPANY INFORMATION REPORT

CARRIER CORP                            ◆
CARRIER TOWER/BOX 4800
SYRACUSE
NY 13201
315-424-4711
NUMBER OF ESTABLISHMENTS -      77
MANUFACTURING SALES -        $1082.5 MILLION.
NON-MANUFACTURING SALES -      $97.5 MILLION.
FOREIGN SALES -               $131.0 MILLION.
TOTAL SALES -                $1311.0 MILLION.

◆

        ECONOMIC INFORMATION SYSTEMS - BUSINESS INFORMATION SYSTEM
                          LINE OF BUSINESS REPORT
                         SUMMARY OF SALES BY INDUSTRY

CARRIER CORP                            ◆

SIC   SIC DESCRIPTION                    SALES  PERCENT   PERCENT   SIC  NO. OF
CODE                                    ($MIL) CO.SALES SIC SALES RANK  ESTAB.

2295  COATED FABRICS, NOT RUBBERIZED     $11.7   0.89      1.06    23      1
2851  PAINTS & ALLIED PRODUCTS          $174.5  13.31      2.79     5     11
2865  CYCLIC CRUDES & INTERMEDIATES      $45.8   3.49      1.03    28      2
2891  ADHESIVES & SEALANTS               $23.6   1.80      1.51    15      2
2893  PRINTING INK                      $120.5   9.19     13.81     1     14
3069  FABRICATED RUBBER PRODUCTS, NE       $.7   0.05      0.01   653      1
3079  MISCELLANEOUS PLASTICS PRODUCT      $7.2   0.54      0.02   794      1
3451  SCREW MACHINE PRODUCTS              $6.6   0.50      0.35    43      2
3511  TURBINES & TURBINE GENERATOR S     $27.0   2.05      0.80     8      1
3542  MACHINE TOOLS, METAL FORMING T      $1.7   0.12      0.22   102      1
3563  AIR AND GAS COMPRESSORS           $101.1   7.71      7.19     3      1
3564  BLOWERS AND FANS                   $15.7   1.19      0.85    25      2
3569  GENERAL INDUSTRIAL MACHINERY,      $26.2   1.99      0.83    17      1
3585  REFRIGERATION & HEATING EQUIPM    $482.4  36.79      4.86     2      7
3599  MACHINERY, EXC ELECTRICAL, NEC      $3.0   0.22      0.05   288      1
3621  MOTORS AND GENERATORS              $15.7   1.19      0.40    40      1
3622  INDUSTRIAL CONTROLS                 $4.5   0.34      0.17    87      1
3676  ELECTRONIC RESISTORS               $14.6   1.11      3.72     8      1
4225  GENERAL WAREHOUSING & STORAGE        $.9   0.06      0.05   298      1
5064  ELECTRICAL APPLIANCES WHLSNG       $15.6   1.18      0.19    95      2
5075  WARM AIR HEATING & AIR COND WH     $42.0   3.20      2.74     1     10
5082  CONSTRUCTION & MINING MACH WHL      $4.7   0.35      0.05   414      1
5084  INDUSTRIAL MACHNRY & EQUIP WHL      $7.5   0.57      0.04   366      2
5085  INDUSTRIAL SUPPLIES WHLSNG          $7.2   0.54      0.09   164      2
5133  PIECE GOODS WHLSNG                  $8.3   0.63      0.11   192      1
5198  PAINTS, VARNISHES, & SUPP WHLS      $5.2   0.39      0.44    38      2
6146  INSTALLMENT SALES FINANCE COS        $.6   0.04      0.01   121      1
7391  RESEARCH & DEVELOPMENT LABS         $3.9   0.29      0.10   102      3
7623  REFRIGERATION SERVICE & REPAIR      $1.6   0.12      2.50     4      1

       TOTAL MANUFACTURING SALES       $1082.5  82.57

       TOTAL NONMANUFACTURING SALES      $97.5   7.43

       TOTAL FOREIGN / OTHER SALES      $131.0   9.99

              COMPANY TOTAL            $1311.0 MILLION.
```

FIGURE 11-6: MARKET REPORT ON ONE INDUSTRY. (STARS UNDER OWNERSHIP INDICATE PUBLIC-SHARES OWNERSHIP)

```
 EBIS GENERAL INDUSTRY INFORMATION REPORT

SIC CODE - 5945
INDUSTRY DESCRIPTION - HOBBY, TOY, & GAME SHOPS
NUMBER OF FIRMS -              82
NUMBER OF ESTABLISHMENTS -    102
TOTAL SALES -               $274.4 MILLION.


◆


DO YOU WANT TO SEE INDUSTRY BREAKDOWN BY COMPANY?
ENTER Y OR N.
? Y
ENTER ALTERNATIVE PERCENTILE STARTING POINT, IF DESIRED.
DEFAULT = 100 (TOP-DOWN REPORTING).
?
IF YOU WANT A LIMITED NUMBER OF COMPANIES REPORTING, ENTER THAT NUMBER.
? 8
IF YOU WANT TO LIMIT THE REPORT TO A CUMULATED PERCENT, ENTER THAT NUMBER.
?
THE APPLICATION CHARGE FOR THE REQUESTED REPORT WILL BE    $35.00
DO YOU WANT THE REPORT?  ENTER Y OR N.
? Y

◆


         ECONOMIC INFORMATION SYSTEMS - BUSINESS INFORMATION SYSTEM
                          SHARE OF MARKET REPORT
                       INDUSTRY ANALYSIS BY COMPANY

5945 HOBBY, TOY, & GAME SHOPS

                                  OWNER-  ESTIMATED   SHARE   CUMUL.  NO. OF
RANK COMPANY                      SHIP    SALES($MIL) OF MKT  SHARE   ESTAB.

   1 TANDYCRAFTS INC               ◆      $101.4     36.95   36.95     14
     1800 ONE TANDY CENTER
     FORT WORTH      TX 76102
   2 LIONEL CORP                   ◆       $38.6     14.07   51.02      3
     9 W57TH ST
     NEW YORK        NY 10019
   3 HOBBY CENTER INC                      $11.1      4.05   55.07      5
     POTTER VIL CTR
     FREMONT         OH 43420
   4 S GELLIS & CO                 ◆       $11.0      4.01   59.08      1
     492 CEDAR ST
     NEWINGTON       CT 06111
   5 GAMBLE SKOGMO INC             ◆        $8.1      2.95   62.03      1
     15 N 8TH ST
     MINNEAPOLIS     MN 55403
   6 GENERAL MILLS INC             ◆        $5.6      2.04   64.07      2
     PO BOX 1113
     MINNEAPOLIS     MN 55440
   7 KAUFMAN BROS INC                       $4.1      1.49   65.56      1
     RT 102 S
     LEE             MA 01238
   8 TOYS R US                              $2.7      0.98   66.54      1
     1601 OLD DEERFIELD RD
     HIGHLAND PARK IL 60035

               CUMUL. SALES TOTAL -   $182.6 MILLION.

                   INDUSTRY TOTAL -   $274.4 MILLION.
```

FIGURE 11-7: MARKET REPORT ON TWO INDUSTRIES IN THREE COUNTIES (GEOGRAPHIC ADMINISTRATIVE UNITS) IN STATE OF MINNESOTA IN U.S.

◆

ECONOMIC INFORMATION SYSTEMS - BUSINESS INFORMATION SYSTEM
COUNTY MARKET SIZE REPORT
ANALYSIS OF INDUSTRY BY GEOGRAPHY

MINNESOTA		NO. OF ESTAB. WITH EMPLOYMENT OF						
SIC	SIC DESCRIPTION	20 TO 49	50 TO 99	100 TO 249	250 TO 499	500 AND OVER	TOTAL	ESTIM. SALES ($000)
053	HENNEPIN							
2011	MEAT PACKING PLANTS	2	1	0	0	0	3	35,800
2013	SAUSAGE & OTHER PREPARED MEATS	1	3	1	1	0	6	64,800
	COUNTY TOTALS	1487	391	322	165	113	2478	34,333,400
037	DAKOTA							
2011	MEAT PACKING PLANTS	0	2	0	0	1	3	429,800
2013	SAUSAGE & OTHER PREPARED MEATS	1	0	1	0	0	2	16,700
	COUNTY TOTALS	108	25	16	11	4	164	1,501,200
123	RAMSEY							
2011	MEAT PACKING PLANTS	0	0	4	0	0	4	145,200
2013	SAUSAGE & OTHER PREPARED MEATS	0	1	0	0	0	1	6,000
	COUNTY TOTALS	608	140	128	53	73	1002	13,494,900
	SELECTION TOTALS	4	7	6	1	1	19	698,300
	STATE TOTALS	5927	990	812	369	287	8385	77,589,500

11.5.4 STATISTICAL CORRELATION

Predicast, Inc. (described in Appendix.) produces among other bibliographic and non-bibliographic (statistical) data bases with capabilities to interact with each other. Furthermore, statistical data bases have built in capabilities to cross-tabulate data, perform a set of statistical operations (as selected by a user from a 'menu' of statistical techniques available) and display the results in desired tabular and graphic formats. E.g. any time series can be calculated against any other one as a dependent versus an independent variable. The choices are large and are entirely up to the user. Clearly, the user has to be familiar not only with retrieval of information, but also with statistical and display capabilities.

The examples shown here are from a database called PTS (Predicasts Terminal Systems) International Statistics Basebooks (available online on Lockheed, BRS, SDC, and Data Star on Euronet). It contains annual historical date and time series for detailed products and industry for all countries in the world. Included are production, consumption, price, foreign trade and usage statistics for agriculture, mining, manufacturing, and service industries. Also included are international statistical composites (time series) consisting of 2500 records on 50 key series for each of the 50 key countries of the world. The 50 key series includes: population, GNP (by detail), per capita income, employment, production or usage of major materials, products, energy, and vehicles. The time series provides historical data since 1958 and projected consensus of published forecasts through 1995.

Figure 11-8, the first example, shows the number of registered automobiles (in 000) over the years 1960-1978 for Argentina, Peru, India and France. The table was compiled as follows:

> First, a time series stored in the data base on car registrations for each country was retrieved; these lists, not shown here, also contain percentage growth rate.
> Second, for each set of data a name was given; in this case CARSARG, CARSPER, CARSIND, and CARSFRA. A user can choose any name to head the table and the column.
> Third, a command was given to the computer to tabulate together the different time series and display them as shown in Figure 11-8.

Figure 11-9 shows the Gross Domestic Product (GDP) per capita (i.e. GDP/person) for Argentina, Peru, India, and France, for the years 1960-1980 and as projected for 1985, 1990, and 1995. The unit of measure in the table is standardized in 000 of 1975 U.S. dollars. The table was composed as follows:

> First, a time series of historic and projected GDP for each of these countries was retrieved in constant 1975 U.S. dollars.
> Second, a time series of historic and projected population data for each of these countries was retrieved.
> Third, a command was given to divide for each year for each country the GDP figure with the population figure.
> Fourth, results were named as GCAARG, (GDP per capita for Argentina), GCAPER, GCAIND, and GCAFRA.
> Fifth, command was given to display the results as shown in Figure 11-9.

Figure 11-10, Figure 11-11, and Figure 11-12 pertain to car registrations in France (CARSFRA) as a function of GDP per capita (GCAFRA) [each shown in previous two figures], and the forecast for France until 1995:

> First, Figure 11-10 shows the statistical regression calculation of the two variables against each other, (cars as dependent and GDP per capita as independent variables).

The regression technique chosen was the so-called ordinary least squares; it calculates the trend in the growth of cars as a function (or in connection with) the trend in GCA.
Second, Figure 11-11, shows the resulting forecast of cars in France (CARSFCST) for up to 1995 in 000. The zero's under CARSFRA indicate that the actual historical figures go only until 1978. The forecast is the result of the regression calculation.
Third, Figure 11-12, displays the results from column CARSFST (forecast of cars in France) from the previous figure in a graphic form.

Figures 11-13 and 11-14 pertain to food grain production in Pakistan. The following names were given (as mentioned, a user can assign any name):

GRAINP: food grain production in Pakistan in millions of tons. This time series was retrieved first (but the original table not presented here). The source for the data (in this case FAO) was also given, together with the growth rate.

INDPROD: industrial production index for Pakistan with 1975 = 100 (base for calculation of other figures). The original table is not presented either.

POPPAK: population of Pakistan in millions of people.

GNFCST: computation of forecast for food grain production (dependent variable) as a function of predictions for industrial production and population (both as independent variables)

GRNPERCP: food grain production per capita in the past and as forecast in tons per person

Figure 11-13 shows the statistical regression calculation of grain production in Pakistan (as a dependent variable) against the industrial production index and population growth (as independent variables). It calculates the grain production trends as a function (or in connection with) the trends in the other two.

Figure 11-14 shows the figures for grain production, industrial production index, population, grain production forecast, and food grain production per capita for Pakistan. Values of 0 indicate that no historic data were available or applicable.

(For more information contact: Predidast Inc., 11001 Cedar Avenue, Cleveland, Ohio 44106, U.S.A.; or in Europe: 206 High Street, Bromley BRI 1PW, United Kingdom).

```
INPUT...TABULATE(YEARS,CARSARG,CARSPER,CARSIND,CARSFRA )

 YEARS  CARSARG  CARSPER  CARSIND  CARSFRA
 *****  *******  *******  *******  *******



  1960     474     68.7
  1961     535     74.7    287.9      5450
  1962     624     83.6    314        6220
  1963     697     94.8    347.6      7070
  1964     806    108.3    358.9      7960
  1965     915    121.8    396.3      8720
  1966    1031    137.4    420.1      9560
  1967    1139    160.4    443.6     10210
  1968    1272    180.2    480.4     10930
  1969    1401    191.3    526.8     11670
  1970    1482    202.7    568       12280
  1971    1680    212.9    622       12990
  1972    1863    221.6    671.3     13800
  1973    2020    234.4    698.4     14550
  1974    2136    250.4    712.2     15100
  1975    2316    267      715       15550
  1976    2469    285.2    696       16250
  1977    2637    300.9    748.2     17000
  1978    2730    312.3    830.1     17780
```

<u>FIGURE 11-8</u>: TABLE OF COMBINED DATA FOR NUMBER OF REGISTERED CARS (IN 000) FOR ARGENTINA, PERU, INDIA AND FRANCE (LISTED RESPECTIVELY AS CARSARG, CARSPER, CARSIND, AND CARSFRA).

```
INPUT...TABULATE(YEARS,GCAPARG,GCAPPER,GCAPIND,GCAPFRA)

 YEARS   GCAPARG    GCAPPER    GCAPIND    GCAPFRA
 *****  ********   ********   ********   ********



  1960   1.0091     .61147     .11924     3.5461
  1961   1.0209     .64341     .12137     3.703
  1962    .99532    .6819      .12172     3.8804
  1963    .94338    .68443     .12478     4.0169
  1964   1.0467     .70986     .13138     4.2351
  1965   1.1195     .72361     .12295     4.3972
  1966   1.1129     .75092     .12165     4.5881
  1967   1.1325     .75873     .12872     4.7659
  1968   1.1605     .73717     .12946     4.9329
  1969   1.2463     .74483     .1347      5.2348
  1970   1.288      .77621     .14146     5.4855
  1971   1.3369     .7932      .14148     5.7284
  1972   1.3674     .81716     .13737     6.0126
  1973   1.4142     .84279     .13822     6.2837
  1974   1.4826     .87633     .13639     6.4429
  1975   1.448      .88041     .14498     6.4183
  1976   1.4055     .88184     .14388     6.7232
  1977   1.4559     .8478      .15084     6.8872
  1978   1.385      .80975     .15625     7.122
  1979   1.4863     .8155      .15699     7.3074
  1980   1.524      .8338      .15971     7.4315

  1985   1.6922     .89877     .17832     8.9853
  1990   1.9884     .98696     .20061    10.55
  1995   2.3181    1.0731      .22093    12.328
```

FIGURE 11-9: GROSS DOMESTIC PRODUCT PER CAPITA (GCA) IN 000 OF CONSTANT 1975 U.S. DOLLARS FOR ARGENTINA (GCAARG), PERU, INDIA, AND FRANCE.

```
INPUT...CARSFCST=FORECAST(CARSFRAX,GCAPFRA,YEARS: 1979, 1980,1985, 1990,
ORDINARY LEAST SQUARES
VARIABLES ...
  CARSFRA    #C   GCAPFRA   YEARS

 INDEPENDENT           ESTIMATED    STANDARD       T-        CONTRIBUTION
  VARIABLE            COEFFICIENT    ERROR      STATISTIC       TO  R**2


#C                   -1421423       31666       -44.89          .1848


GCAPFRA              -57.5          51.99       -1.106          1.122E-4


YEARS                  728          16.2         44.9           .1851

R-SQUARED =    .99835
R-SQUARED(CORRECTED) =    .99817
DURBIN-WATSON STATISTIC =    .4696
NUMBER OF OBSERVATIONS =  21
SUM OF SQUARED RESIDUALS =    644963
STANDARD ERROR OF THE REGRESSION =    189.29


     ACTUAL     FITTED     PLOT: * = ACTUAL   + = FITTED

   1  3910     3769    +
   2  4360     4496.9     *+
   3  4870     5020.8      +
   4  5450     5739.7       *+
   5  6220     6457.4         +
   6  7070     7177.4           +
   7  7960     7892.7             +*
   8  8720     8611.3               +
   9  9560     9328.2                 +
  10 10210      10046                   +
  11 10930      10764                     +
  12 11670      11475                       +
  13 12280      12188                         +
  14 12990      12902                           +
  15 13800      13614                             +*
  16 14550      14326                               +*
  17 15100      15045                                +
  18 15550      15774                                  +
  19 16250      16484                                    +
  20 17000      17203                                      +
  21 17780      17917                                        *+
```

FIGURE 11-10: STATISTICAL REGRESSION CALCULATION OF THE CARS REGISTERED IN FRANCE (CARSFRA) AS A DEPENDENT VARIABLE AGAINST THE GDP PER CAPITA (GCAFRA) AS AN INDEPENDENT VARIABLE. SHOWS ALSO GRAPHICALLY THE GOODNESS OF FIT OF THE STATISTICAL PREDICTIONS.

```
/TABULATE(YEARS,CARSFRAX,GCAPFRA,CARSFCST)
INPUT...TABULATE(YEARS,CARSFRA ,GCAPFRA,CARSFCST)

YEARS  CARSFRA    GCAPFRA   CARSFCST
*****  *******   ********   ********
 1958     3910    0             3910
 1959     4360    0             4360
 1960     4870    3.5461        4870
 1961     5450    3.703         5450
 1962     6220    3.8804        6220
 1963     7070    4.0169        7070
 1964     7960    4.2351        7960
 1965     8720    4.3972        8720
 1966     9560    4.5881        9560
 1967    10210    4.7659       10210
 1968    10930    4.9329       10930
 1969    11670    5.2348       11670
 1970    12280    5.4855       12280
 1971    12990    5.7284       12990
 1972    13800    6.0126       13800
 1973    14550    6.2837       14550
 1974    15100    6.4429       15100
 1975    15550    6.4183       15550
 1976    16250    6.7232       16250
 1977    17000    6.8872       17000
 1978    17780    7.122        17780
 1979        0    7.3074       18634
 1980        0    7.4315       19355
 1985        0    8.9853       22905
 1990        0   10.55         26455
 1995        0   12.328        29992
```

FIGURE 11-11: FIGURES OF REGISTERED CARS IN FRANCE (CARSFRA) (IN 000), GDP PER CAPITA (GCAFRA) (IN 000 OF 1975 U.S.DOLLARS), AND FORECAST FOR CARS AS CALCULATED BY REGRESSION (CARSFCST) (IN 000). VALUES OF 0 INDICATE THAT HISTORIC DATA WERE NOT AVAILABLE OR APPLICABLE.

```
/GRAPH(CARSFCST)
INPUT...GRAPH(CARSFCST)

          + + + + + + + + + + + + + + + + + + + + + +
   29992  +                                      1  +
          +                                         +
          +                                 1       +
          +                                         +
   23471  +                                         +
          +                            1            +
          +                                         +
          +                       1                 +
          +                     11                  +
   16951  +                    1                    +
          +                 111                     +
          +               11                        +
          +             11                          +
          +           11                            +
   10430  +         11                              +
          +        1                                +
          +      11                                 +
          +    11                                   +
          +  11                                     +
    3910  + 1                                       +
          + + + + + + + + + + + + + + + + + + + + + +

            1    1    1    1    1    1    1    1 1
             9    9    9    9    9    9    9    9 9
              5    6    6    7    7    8    8    9 9
               8    3    8    3    8    3    8    3 5

1 = CARSFCST

?
```

FIGURE 11-12: GRAPHICAL DISPLAY OF GROWTH OF REGISTERED CARS AND FORECAST FOR CARS IN FRANCE (IN 000) (COLUMN CARSFCST FROM FIGURE 11-11).

```
INPUT...GRNFCST=FORECAST(GRAINP,INDPRODP,POPPAK,YEARS: 1979,1980, 1985,
ORDINARY LEAST SQUARES
VARIABLES ...
  GRAINP   #C   INDPRODP   POPPAK   YEARS

 INDEPENDENT          ESTIMATED    STANDARD        T-         CONTRIBUTION
 VARIABLE             COEFFICIENT   ERROR        STATISTIC      TO  R**2


#C                    -862.1        429           -2.0           .01584


INDPRODP               .191         .05995         3.1865        .03985


POPPAK                -.1798        .05896        -3.05 6        .03653


YEARS                  .4402        .2193          2.007         .01581

R-SQUARED =    .93325
R-SQUARED(CORRECTED) =    .92148
DURBIN-WATSON STATISTIC =    1.4006
NUMBER OF OBSERVATIONS =  21
SUM OF SQUARED RESIDUALS =    47.533
STANDARD ERROR OF THE REGRESSION =    1.6721

     ACTUAL    FITTED     PLOT: * = ACTUAL   + = FITTED

  1  0    -.26345         +*
  2  0     .17671         *+
  3  0    -1.5218       +  *
  4  0    -.1343          +
  5  0     1.1494          *   +
  6  0     2.5459          *      +
  7  0     3.7888          *         +
  8  7.26     5.0623                       +    *
  9  7.28     6.3185                          + *
 10  8.17     7.1847                            +   *
 11  10.79     8.4193                                +     *
 12  11.57     9.8306                                   +    *
 13  12.1     12.074                                         +
 14  11.34     12.378                                      *  +
 15  11.8      11.335                                     +*
 16  12.73     13.339                                         * +
 17  12.52     13.996                                         *  +
 18  13.13     13.685                                          * +
 19  14.26     13.555                                           + *
 20  15.12     13.927                                            +  *
 21  14.52     15.745                                              *  +
```

FIGURE 11-13: STATISTICAL REGRESSION CALCULATION OF GRAIN PRODUCTION IN PAKISTAN AS A DEPENDENT VARIABLE, AGAINST INDUSTRIAL PRODUCTION INDEX AND POPULATION AS INDEPENDENT VARIABLES. SHOWS ALSO GRAPHICALLY THE GOODNESS OF FIT OF THE STATISTICAL PREDICTIONS.

```
INPUT...TABULATE(YEARS,GRAINP,INDPRODP,POPPAK,GRNFCST,GRNPERCP)
 YEARS  GRAINP   INDPRODP   POPPAK    GRNFCST  GRNPERCP
 *****  ******   ********  ********   *******  ********
  1958    0          0        0          0      0
  1959    0          0        0          0      0
  1960    0         29       42.695      0      0
  1961    0         35       43.8        0      0
  1962    0         40       44.42       0      0
  1963    0         46       45.475      0      0
  1964    0         53       48.446      0      0
  1965    7.26      59       50.185      7.26    .14466
  1966    7.28      65       52.02       7.28    .13995
  1967    8.17      69       53.9        8.17    .15158
  1968   10.79      75       55.855     10.79    .19318
  1969   11.57      82       57.89      11.57    .19986
  1970   12.1       94       60.61      12.1     .19964
  1971   11.34      95       62.43      11.34    .18164
  1972   11.8       89       64.3       11.8     .18351
  1973   12.73      99       66.23      12.73    .19221
  1974   12.52     102       68.21      12.52    .18355
  1975   13.13     100       70.26      13.13    .18688
  1976   14.26      99       72.37      14.26    .19704
  1977   15.12     101       74.87      15.12    .20195
  1978   14.52     110       76.77      14.52    .18914
  1979    0        117       79.84      16.97    .21255
  1980    0        125       80.6       18.802   .23327
  1985    0        163       95         25.671   .27022
  1990    0        212       111.3      34.3     .30818
  1995    0        270       129        44.397   .34416
```

FIGURE 11-14: FIGURES FOR FOOD GRAIN PRODUCTION IN PAKISTAN (GRAINP) (IN MILL TONS), HISTORICAL AND FORECAST INDUSTRIAL PRODUCTION INDEX FOR PAKISTAN (INDPRODP) (1975 = 100), HISTORICAL AND FORECAST POPULATION (POPPAK) (IN MILL), FORECAST FOR FOOD GRAIN PRODUCTION PER CAPITA (GRNPERCP) (IN TONS PER PERSON). VALUES OF 0 INDICATE THAT HISTORIC DATA WERE NOT AVAILABLE OR APPLICABLE. FORECAST FOR FOOD GRAIN (GRNFCST)

12. DISSEMINATION AND MARKETING OF INFORMATION

12.1 OVERVIEW

> *DISSEMINATION is a process (or processes) of conveying information through given channels to users; dissemination includes the spreading about, distribution and delivery of information products and/or services.*
>
> *MARKETING of information is an aggregate of activities directed at satsifying human information needs and wants through exchange processes; marketing involves viewing the whole information service or product from the point of view of final results i.e. from the use and user points of view.*

A job of an information consolidation unit, (or for the majority of information systems, for that matter), has not been completed with the production of a product or institution of a service. Active dissemination and active marketing has to be included as an integral part of the whole unit or system. Otherwise, the products will,for the most part, remain on the shelves and the services will be unused, except by few people. Yet, time and again information systems throughout the world neglect to pay adequate attention to these extremely important functions. For the lack of active dissemination and marketing, otherwise good information products and services lay shallow and unused. And the tragic aspect of it is that so often there is nothing intrinsically wrong with the product or service, but the culprit in the failure is the inadequacy in dissemination and the lack of marketing. The situation is observed in developed and in developing countries alike.

On the other hand, there are splendid examples of what proper dissemination and marketing of information and service can do. The success of the online information industry is due as much to the ways by which products and services are marketed as to the intrinsic merit of these products and services offered. Treatment of marketing as an integral part of their products and services (where marketing particularly includes great attention to user education) was a key element in the spectacular growth of that new industry. All information systems and services, throughout the world, and particularly information consolidation units, should take heed and learn.

Why do information systems pay so little and so inadequate attention to active dissemination and marketing? For three reasons:

First, it has to do with the tradition and education of information specialists and librarians: active dissemination and marketing was not and, still is not, cultivated as an integral part of the profession and its education. The traditional assumption, still pervading today, is that the users will find the way to an information systems' door by themselves, if the system in question offers a good product, collection or service. Some users indeed will, but most won't. To reiterate: many information professionals believe that any product or service properly designed to meet a need and professionally implemented will enjoy widespread utilization. However, in practice, such assumption or belief has to be supplemented; typically widespread utilization occrs only when an additional conscious and deliberate effort is made to market the service or product and make the potential users aware of its services or products and of its benefits (12-7).

Second, found among information professionals is an uneasy attitude toward active dissemination and marketing, the latter in particular. This attitude can be paraphrased as: "There is something vaguely unethical about marketing of information and if not unethical then at least distasteful." Unethical? No. Marketing is not to be equated with pushiness and high-pressure selling of products or services, some of them rather shabby -- this is a total misunderstanding of what marketing is all about. If anything, marketing is the reverse selling concept. Distasteful? Possibly, but only in so far as any complex problem and hard work may be distasteful. These attitudes are not only wrong, but also harmful for both a service and its users.

Third, there is at times a philosophical opposition to active dissemination and especially marketing on the ground that they introduce an element of commercialization in information work. The argument is that commercial aspects (which involve consideration of markets, costs, prices, value received, exchange, etc.) have a distorting effect on information products and services which should be viewed on their own intrinsic merit. Marketing certainly does involve considerations of costs and economics in relation to both information systems and users and, in that sense, it involves commercial aspects, but not at the exclusion of all others. In cases where, as a matter of policy, information systems are fully and continuously subsidized without necessity for any accounting regarding costs, cost-effectiveness, and cost- and user-benefits this philosophy is in place and it should not be argued with. In the case where such policy is not in effect absence of market consideration is harmful and this philosophy is out of place. So, it is not a question of philosophy at all, but a question of the type of policies in support of a given information system in general and information consolidation units in particular. An information system can afford the luxury of not worrying about the market and connected economic/commercial aspects if and only if it is fully subsidized without questions asked. There certainly is a place for such systems. The Alexandrian library is a splendid example of this sort of thing. But an overwhelming majority of information consolidation units are not supported in such a way.

To put it bluntly, an information consolidation unit without active dissemination and marketing integrated with products and services offered will inevitably fail. This statement can be made with such certainty because the probability of success without active and integrated dissemination and marketing is infinitesimal.

12.2 DISSEMINATION

As mentioned earlier dissemination pertains to the conveying of information to users through given channels. or in a practical sense it means the spreading about, distribution and delivery of information products and services. There are a great number of ways and means by which dissemination can be affected. Some of them are combined or integrated with the means of processing,sorting and/or packaging information, as discussed in the previous Chapter -- at times neat distinctions are not possible. Thus, the discussion in this Section should be taken in conjunction with the discussion in Chapter 11 on packaging. Some of the more important channels for dissemination of information consolidation products include:

1. *Interpersonal delivery*

MAJOR CHANNELS FOR DISSEMINATION:

2. Group personal delivery
3. Strategic placement
4. In-house dissemination
5. Local depository
6. Mass Media - print
7. Broadcasting
8. Mail
9. Telephone
10. Computer network

1. Interpersonal delivery. The products are personally delivered to users, either at their request or in anticipation of a need. To be effective, the interpersonal delivery has to involve much more than the handing out of products, e.g. more than distributing handbills on a street corner. If interpersonal delivery includes personal conversation, consultation, and feedback from users, then this is the most effective dissemination method there is. However, it is unfortunately also the most costly and time consuming method, it has to be prepared well, and it is not suited for mass dissemination. As always, it is a matter of trade-off: high effectiveness but at a high cost and bother.

2. Group personal delivery. The products are delivered to a whole group of users, as in a meeting, conference, seminar, demonstration, etc. The possibilities for personal exchanges and feedback are still there. This method also needs careful personal preparation for involvement, not only for handing out the proudct. It reaches more people than the interpersonal delivery, and as such it is still costly and very effective.

3. Strategic placement. The products are placed at strategic locations

for users to pick them up on their own. The location can include: places of work, places of worship, specially constructed booths, stores, meeting halls, sport events, lunch counters, etc. etc. The location has to be selected with great care and tested. Where and how products are placed does greatly affect the attention paid to a product. Even in a good location, a pile of leaflets or brochures by itself is not enough. They have to be advertised and accompanied by attention getting devices, posters, etc. Wall posters themselves can be a product put on walls in strategic locations.

4. In-house dissemination. An information consolidation unit can institute a distinct in-house dissemination function (such as a circulation department). There are a number of services that can be instituted in conjunction with dissemination: reference, referral, question-answering, photocopying, etc. The policies for these functions have to be carefully formulated.

5. Local depositories. This involves distribution of products through cooperative arrangements with an information system or library not directly associated with the information consolidation units, such as branch libraries, extension agents, laboratories, educational institutions, government information offices, etc. Establishing a cooperative formula is essential for success. If the cooperating agency has some clear self-interest in the product, the success of distribution is more assured. A strong case for such self-interest has to be made and explained, or the self-interest should be clearly built in the product.

6. Mass media. Local newspapers, professional journals, national magazines, and other print mass media can be very effective for mass dissemination, particularly at the awareness stage. However, the products have to be specifically modified to fit the requirements of the mass media, usually

in terms of length, narrative style, etc. Advertising through mass media should also be considered as a dissemination channel. In a different way, wall posters are also a mass media of proven success. So are photonovels. Thus, in addition to newspapers, other print mass media should be considered.

7. Broadcasting. Radio and television are another dissemination media of enormous potential and proven success. Radio, in particular, has penetrated even the remotest and poorest parts of most developing countries and television is in common use in urban centers, even in the slums. Two way radio was successfully used for classroom instruction where distances were too great for school attendance. Specially devised radio shows dispensing useful work, crop, husbandry and other agricultural information have proven to be very popular among farmers all over the globe. Instructional and training show-how TV shows have also been very well received wherever shown. However, the broadcasting media have been relatively neglected in information consolidation, despite their potential.

Exploitation of broadcasting media should receive a high priority when considering dissemination channels for information consolidation. Radio and TV shows or just scripts can be prepared for wide distribution to broadcasting stations. An information consolidation unit doesn't have to go into broadcasting or show business to disseminate through broadcasting: scripts will suffice.

8. Mail. Mailing of products through postal facilities is another popular and effective channel for dissemination (predicated, of course, on the proper functioning of mail services). However, great attention has to be paid to establishing proper mailing lists. Mass mailings to addresses such as "Occupant" or to institutions at large and not persons in institutions are ineffective: they are likely to be tossed away, or they will not

reach the proper person. Establishing and keeping a proper mailing list up to date is often a difficult proposition, however, it is also crucial because a proper mailing list will ensure that a product gets into the hands of the appropriate individuals. Mailing lists can be established in a number of ways, e.g.

* by selecting from directories or rosters (of employees, organizations, professional associations, town or church rosters, etc.)
* by selecting from attendance lists of meetings, conferences, seminars, schools, etc.
* by canvassing an organization, neighborhood, social unit, etc.
* by mass advertising or posters inviting the interested persons to send their names and addresses
* by purchase from a firm, organization, or individual already having a general or specialized mailing list.

Upon establishing a large mailing list, specialized or classified mailing lists can be developed. It is useful to have mailing lists divided by groups of people of similar education, occupation, affiliation, background, and interest to enable more targeted mailings. Mailing lists can be subdivided by asking the people on a larger mailing list to indicate choices of products (e.g. restriction on what and how much they want to receive , types of desired materials: reviews, pamphlets, booklets, management-oriented, employee-oriented, etc.). The more a mailing is targeted to a specific audience and the more personal each mailing piece is the more likely its success.

9. Telephone. Information can be very effectively disseminated over the phone, because it has an element of interpersonal contact and allows for instant feedback. (Provided, of course, that there are accessible phones

to users and the phone network functions without great difficulties). Telephone 'hot-lines' can be established. Or for mass use, prerecorded information is played back upon dialing a number. In a number of urban centers healthlines have proven to be very popular and highly used. Cassettes on a relatively large number of health topics have been recorded by physicians; these topics include those for which most often physician's advice has been sought and questions asked, including many touchy medical subjects about which people are reluctant to ask information. Lists of available topics are widely distributed, including through newspaper ads. People call the number, a person answers and engages a cassette player with the requested topic. The popularity of the service is in the protection of anonymity and privacy of callers and in low costs: that of a phone call.

10. Computer networks. Disseminating information from or through a computer via telecommunication networks has also proven very effective. (Naturally, a prerequisite is the existence of and access to a computer network; many such networks exist in developed countries, and some have been initiated in developing countries, e.g. Mexico and Brazil.) This includes, in addition to online searching of data bases, (as discussed and shown in previous chapters) computer conferencing and electronic mail. Their potential, where existing, for dissemination of consolidated information is great. A practical example of computer conferencing is described in Section 7.7.2 in conjunction with reaching concensus on the Hepatitis Knowledge Base.

12.3 MARKETING OF INFORMATION

12.3.1 MARKETING CONCEPT

Selling is having an automobile and trying to find a buyer. Marketing is looking at transportation needs or wants and devising and offering a vehicle(be it an automobile, a cart, a bicycle or plane) that will satisfy a transportation need or want at an exchange rate that the market will bear. One sells automobiles and markets transportation. One sells toothpaste and markets whatever will satisfy dental hygiene for health, or even sex appeal. One sells or offers a pamphlet on solar rice drying and markets a solution that will increase productivity and lower the cost of getting rice ready as a cash crop. One offers or sells an information consolidation product, but looks at a market and devises a product that the market needs or wants and can afford; 'afford' doesn't necessarily have to be in terms of money, but also in terms of a user's time that he or she has to put in to assimilate the information. One sells books, pamphlets, or even information, but markets a solution to a problem. Get it? The distinction is crucial.

Marketing is an aggregate of many activities as described below. Promotion is just one of them. Marketing is much more than promotion or advertising. Producing a glossy pamphlet about an information product or service, advertising it, talking about it ... all could and should be a part of marketing. But, it is a misconception to equate any promotion or even an elaborate promotion campaign by itself as marketing. Unfortunately, quite often in information work behind a statement: "We are marketing our information products and services" stands nothing more than a brochure highlighting what's offered. If there is nothing more, that's not marketing; i.e. promotion by itself is not marketing. This distinction is also crucial as the one between selling and marketing.

The central concept in marketing is in being customer and not product oriented. The contemporary approach to marketing is simple to learn: (i) identify your intended customer (user) groups, (ii) find out all you can about their needs and wants and (iii) try to satisfy them with the right products and/or services, supported by the right communication or promotion and available at the right time and location. Although this is simple to learn, the managing of the marketing function demands more creativity and more astute judgement than any other single function in information consolidation.

Using this modern concept of marketing,an alert information manager designs the information system's (or information consolidation unit's) organizational structure to give the marketing component its deserved prominence. The marketing function should be fully integrated with other traditional functions of an information system (selection, acquisition, representation, organization, storage, retrieval, dissemination...) and placed in a position to coordinate them. The system's marketing strategies and tactics should be purposeful, well organized, and projected years in advance. Within a marketing - oriented information system, planning responds to social, cultural and environmental changes and displays great flexibility (12-1). Marketing of information consolidation products and services involves at least these elements:

ELEMENTS IN MARKETING OF INFORMATION:

1. Market research and analysis.
2. Segmentation of the clientele.
3. Development (or adaptation) of products or services as targeted to a given segment or segments.
4. Consideration of costs and prices.
5. Promotion.
6. User education.
7. Dissemination.
8. Evaluation of products and services.

The first six elements are discussed below. Dissemination was discussed in the previous section. Evaluation is discussed in Section 13.9.

12.3.2 MARKET RESEARCH AND SEGMENTATION

This activity implies serious research into and analysis of the information needs and wants of a population in terms of various social groups. The model, variables and methods for user studies described in Chapter 4 are directly adaptable for a market research study, thus they are not repeated here. As a matter of fact, a market information study is a user study, with possible addition or stress of economic aspects and contraints, as well as testing of alternate products or services.

The analysis of market research results at minimum produces information on these two aspects:

1. Segments (groups, classes) of population of potential users with similar information needs or wants, as well as, for each segment, their communication patterns and habits, economic and other constraints, and other characteristics which influence a choice of an information product or service. Also included should be the segmentation of benefits to users.
2. Suggestions on alternate information products and services that may satisfy needs or wants of each segment. If testing a product or service was involved, evaluation of usage is included.

In marketing terminology, the first aspect is called segmentation: clearly identifying groups of people with some similarities regarding charactertistics and benefits. Segmentation is necessary, because there is no such thing as producing a product that can be all things to all people. (Even toothbrushes differ on the basis of different segments of people and needs). Segmentation is a key concept and the starting point in marketing. Without segmentation there is no marketing.

The second aspect (information concerning likely products) involves external and internal components that need to be integrated. Externally, this involves a thorough knowledge of the state-of-the-art of the given product or service, of competition (and there always is competition in information supply, even if it isn't head-on competition), and other external effects. Internally, this involves consideration of own capabilities and constraints, but most importantly it involves creativity, imagination, inventiveness, vision, and assessment of alternatives. Originality may or may not be involved; copying or adapting a product or service is perfectly admissible, but a decision on what to copy and/or how to adapt it, still requires an astute judgment and even vision and imagination.

Thus, market research, as any research, is a combination of: (i) assumptions, (ii) cold facts, figures and observations and (iii) human imagination and judgement. And, as in any research,it is not foolproof. The results are not guaranteed. However, the worst situation occurs when the results are indeed good (reflect the reality of user's needs or wants, together with suggestions for appropriate products) but these are not heeded by a blind management. There is such a things as being blind (even completely blind) to the realities (even worse,evident realities) of a market and a potential of a product or service.

12.3.3 PRODUCT DEVELOPMENT AND TARGETING

Development of a product should be coupled from the outset with an idea that it will be targeted to a given segment of the audience and for their given needs or wants. Examples of such targeting are given in Chapter 4, together with product characteristics that should be considered.

Development of an information consolidation product also involves: consideration of alternatives, determination of the criteria and procedures for selection and evaluation, analysis and synthesis, and overall production and dissemination. These were treated in respective chapters, thus are not repeated here.

12.3.4 COSTS AND PRICING

There is no such thing as "free" information. All information processing involves costs, but all information products or services may not involve a price for a customer. An information product may be free of paying directly by a customer, but it is never free of paying of costs by somebody at some point in the process.

The meaning of terminology associated with the costs of information varies in subtle ways from one treatment in the literature to another. Thus, we shall give the meanings as treated in this Handbook.

> *COST of information refers to all expenditures incurred in production and dissemination of information products or services.*
>
> *COST ACCOUNTING is the recording of expenditures for each function, unit or administrative division of an information system.*
>
> *COST EFFECTIVENESS refers to internal performance as to costs of different operations or functions or of comparison of alternate ways of doing the same operation or function.*

> COST BENEFITS *refer to external values accrued to and by users of an information product or service in relation to costs expended.*
>
> PRICE *is the direct expenditure required of users to obtain a product or service.*
>
> PRICING *is the process of determining the price to be charged to users.*

Determining internal costs of a product or service is by no means a simple and straightforward proposition, because cost accounting can be done in different ways. Furthermore, determination of elements in the cost accounting can alter the picture: Should overhead costs be included? Depreciation of equipment? Support services from parent organization (if any)? etc. Budget of an information system can rarely be equated with costs of a product or service. Because of these difficulties it is not uncommon to find a system without any idea as to the true cost of a product or service it offers. Budget yes, but costs no. However, if and when any prices are considered, cost effectiveness is questioned, budgets are defended and cost benefits are played up, determination of costs is paramount and basic. In turn to achieve that, cost accounting procedures and boundaries for inclusions into costs have to be specified. Unfortunately, no standardized cost accounting procedures for information systems exist, nor are there any standardized forms for reporting of cost data. Costs are rarely reported anyhow. Thus, comparisons are hard to make (if not impossible), since even where costs are reported, the method of accounting and the inclusions/exclusions from accounting are almost never accounted for.

Pricing decisions are a different proposition. Even a decision on not to directly charge a user anything for a product or service (i.e. to offer information free of charge) is a pricing decision. Offering information free of charge can be a decision with mixed blessings: on the one hand, 'free' information does attract customers, and on the other, people often do not attach much value to that which they get free. Thus, the no-charge pricing policy should be carefully weighed. However, this may be academic for a great many information consolidation units because in order to survive they have to recover at least some, if not all, of their costs.

There are a number of pricing schemes applied in relation to information products:

- Marginal cost: price based on arbitrary decision to recover part of the costs.
- Cost-recovery: price based on recovering the production cost of an item or service. This in turn can be based on:
  (i) fixed percentage prices, or
  (ii) revenue/users prices, based on revenue derived from the estimated number of users.
- Past prices, based on knowledge of past prices if they exist with escalation factors added (such as inflation rate).
- Variable price, based on ability to pay (e.g. sliding scale, no charge for some, higher price for others).
- Market will bear price, based on estimates of the users' willingness to pay.
- Costs plus price: based on a profit percentage added to the investment in producing a product or service. Again, this can be done as a fixed percentage or revenue/users ratio.

The economy of scale works clearly and most directly when the scheme involves the revenue/user ratio (either in cost recovery or cost-plus situation): the more users there are, the bigger the spread to charge-off costs and the lower the price. An active development of a market can bring in more users and thus can bring the price down.

There is another aspect to consider: price elasticity. Increase in the price of a product may decrease the number of customers and decrease in price may increase the number of customers. But, how elastic are these ratios? At times, even the institution of a small charge, where there was none before, may drastically affect the number of customers; many will fall away, but those that remain will be truly using the product. Pricing is in a way also a test of the value to customers of a product.

Finally, let us discuss the ethics of pricing information products. Information has costs, there is no way out of it. Either directly (through direct charges) or indirectly (through taxes, charges added to other products, work exchange) the end-users pay for costs of information. The ethical question is: should the end users be directly charged for information products? This question can be answered only within the frame of values and conditions of a given society. There is no universal answer. Situational ethics pertain. However, the question can also be rephrased: should those who can afford it not be required to pay?

12.3.5 PROMOTION

Promotion of an information product or service should be considered in terms of communication to and with specific user segments and not just as an announcement to the world of the product's existence. Promotion can be done in a great many ways. Here are some of them:

* Brochures, pamphlets, posters: explanation of product and service,

directions on how to obtain more information and/or the product?

- Guides, handbooks: directions and steps in use of a product or service.
- Advertising the product or service in newspapers, on radio or TV, in house-news letters, professional society journals, in programs of meetings, etc.
- Publicity, getting articles or interviews about the product, its use, benefits, etc. into newspapers, journals, radio, TV, etc.
- Exhibitions and demonstrations, showing the product at fairs, meetings, conferences, in stores, at work, through a mobile unit, etc.
- Personal approach, visits to users, presenting papers at conferences and meetings, writing letters, word-of-mouth encouragement, sessions on user orientation, etc.

To be effective, promotion has to be planned as a continuous affair with a mix of most, if not all the approaches mentioned above. A one-shot ad or brochure by itself can have only little effect, if any, because the effect of promotion is cumulative and not just tied to any single effort. Thus, repetition, mix and trying out of various (even unconventional) approaches is necessary.

12.3.6 USER EDUCATION

User education can be a crucial element in the success or failure of an information product or service. The aims of user education are to:

1. Communicate about a product or service and show how it fits

in a broader framework and concern of users.

2. Explain the basics of its structure and functions, limitations and problems.
3. Explain in detail (with examples) the benefits that can be accrued.
4. Explain in detail the way it can be accessed and used. If necessary, train for usage (such as in online searching).
5. Explain clearly direct and hidden costs, requirements, conditions of use.
6. Elicit comments and evaluations from users for improvement of the product or service.

A well designed and integrated approach to user education has a great power, as has been so clearly shown by the success of user education and training in relation to online searching and data bases in the U.S. There, the online vendors and data base producers have mounted a concentrated, highly professional continuous, and traveling online user education effort which was as responsible for the phenomenal growth of the industry, as was the intrinsic merit of online products and services themselves.

The main role of user education is to ensure the credibility of the product and trust, in its worth and to increase understanding, know-how and skills in using information. The worst in user education is for it to be perceived as an effort in selling, or as a 'big brother'.

The elements to be considered in designing, developing, and implementing user education include:

* Selection of a topic of user education, starting not from:
  "What is it that I want to present?" but from: "What is the situation, perception and interest of the user and how does what I know and have fit?"

- Adjustment of the topic to indigenous environment and developmental process, level and situation.
- Incorporation of the indigenous information situation.
- Consideration of the conditions of presentation.
- Incorporation of feedback loops from the audience. The strategy for user education should incorporate reexamination of products and services.

Each of these has to be studied and specified in detail before one can mount a successful effort. As in promotion, successful user education can not be a one shot effort: the effects are not direct but cumulative. Thus, there has to be a user education program, if necessary peopled with travelling information troubadours.

A sample of general considerations in pricing and marketing of products and services from information analysis centers is shown in Figures 12-1 and 12-2, reprinted from (12-10).

FIGURE 12-1 FACTORS INFLUENCING THE MARKETING OF INFORMATION ANALYSIS CENTER PRODUCTS AND SERVICES

BASIC FACTORS

- National Information Analysis Center Objectives
- National Information Analysis Center Policy on Service Charges
- Funding Levels for Information Analysis Centers

SPECIFIC FACTORS

- Users
  - Size of user audience
  - Location of user audience
  - User characteristics
    - User needs
    - Communication practices
    - Urgency of information requirements
    - Ability to pay for information
    - Willingness to pay for information
    - Traditional information purchasing practices
    - Necessity for direct user-to-IAC contact
- Products and Services
  - Publications
    - Volume or number of copies distributed
    - Number of pages per publication
    - Urgency for dissemination
    - Rate at which material becomes outdated
    - Use of restricted or limited access documents as input to publications
    - Use of publications in exchange for user information
    - Profit that may be recovered
    - Packaging
  - Inquiry services
    - Number of inquiries answered
    - User willingness and ability to pay
    - Cost of providing service
    - Urgency of response needed
    - *Quid pro quo* arrangements
    - Interface marketing and accounting organization interest
  - Distribution or Dissemination Channels
    - User acceptance
    - Availability of Government printing and distribution facilities
    - Commercial publisher or interface organization interest
    - Nature of the market and users
    - Nature of the IAC publications and services
    - Sales effort required
    - Special situations
      - Organization policies or restrictions
      - Contractual requirements
  - Advertising and Sales Promotion
    - Funds to accomplish this marketing activity
    - Method used to maintain an awareness of users of the IAC
      - Personal contact
      - Mass contact
      - Special promotional activities
    - Stage of IAC development
- Price
  - Uniqueness of IAC product or service
  - Demand for the IAC product and service at a "price"
  - Price determination from cost of providing the product or service

Reprinted from:

Veazie, Walter H., Jr.; Connolly, Thomas F. The Marketing of Information Analysis Center Products and Services. Washington, D.C.: ERIC Clearinghouse on Library and Information Sciences, 1971 (ED 050 722).

FIGURE 12-2 ADVANTAGES AND DISADVANTAGES OF SERVICE CHARGES FOR INFORMATION ANALYSIS CENTER PRODUCTS AND SERVICES

PUBLICATIONS

ADVANTAGES

- Reduced direct charge to the sponsoring agency for publication
- Revenue returned to supplement or eliminate government funding
- Broader distribution of publications to private industry and foreign organizations who would be willing to pay for such products
- Broader announcement of publications with anticipated increased utilization
- Reduce the IAC's time required to handle requests for publications
- Require better selection of report topics which would be of wider interest
- Justify the elimination of IACs which are not productive in terms of revenue secured
- Eliminate "free loaders"

DISADVANTAGES

- Increased indirect cost to the government by paper processing costs and fees – cost shifted from one pocket to another
- Prevent some possible users from getting the products
- Time lag for publication by government or commercial printers
- Time lag caused by the procurement cycle
- Elimination of limited government research data from inclusion in publicly available reports
- Reduce input of information from exchange contributors
- A tendency to emphasize the publication of reports with a broad user audience at the expense of special reports with a limited audience, but which are important in accomplishing the center's mission
- Increased time for book or handbook generation vs. reports due to permanent comprehensive nature of books and associated graphics

INQUIRY ANSWERING SERVICES

ADVANTAGES

- Increased use by private and foreign organizations
- Reasonable rationale to handle proprietary interests of users
- Require the IAC to be more responsive – provide a better product
- Determine if the service can be self-supporting
- Reduced direct cost to the sponsoring government agency
- Require greater IAC cost effectiveness
- Demonstrate to Congress and management of user organizations the costs and benefits of this type of service
- Necessitate mass marketing which should increase the number of users
- Require government action to encourage the use of IACs in program planning, procurement, and program reviews to assure that current state-of-the-art science and technology are used (Such action is necessary if the IACs are to remain in operation)

DISADVANTAGES

- Reduced use of the service by financially hard-pressed government agencies and contractors
- Reduction of user – IAC specialist relationship
- Time lag resulting from purchase request requirements
- Billing problems associated with the service
- Possible shift of use to private industry and foreign organizations
- Loss of exchange arrangements – reduced processing of state-of-the-art information
- Increased cost to the government as a result of double overhead – fee payment by center and user organizations
- Profit or fee to a commercial interface organization or government service
- Develop possible competition between IACs for limited user service dollars and potential competition between the IAC and commercial organizations in covering the same subject areas

Reprinted from:

Veazie, Walter H., Jr.; Connolly, Thomas F. The Marketing of Information Analysis Center Products and Services. Washington, D.C.: ERIC Clearinghouse on Library and Information Sciences, 1971 (ED 050 722).

13 SUMMARY OF REQUIREMENTS FOR INFORMATION CONSOLIDATION

13.1 FUNDAMENTAL QUESTIONS AND FRAMEWORK

Information consolidation involves selection, evaluation, analysis, synthesis, possibly restructuring and repackaging of information, as well as dissemination and marketing of resulting products and services. The efforts connected with these functions are complex, demanding, and costly. However, the fundamental questions are not how (i) effective or (ii) efficient are these functions per se, but:

1. What can an information consolidation unit do to assist an information user in identifying, clarifying, or solving a problem?
2. What can an information consolidation unit do to raise the probability that a user will find useful information with the least effort?

The questions form a foundation on which to build any and all information consolidation units, if they are truly to do user-oriented information consolidation. The questions provide a philosophical and a practical, operational framework for viewing the objectives, processes, and products, of information consolidation units and for evaluating the successes and failures. These questions, in effect, define information consolidation.

From such a foundation and framework follows the first and basic requirements for information consolidation: Study thy users. The users should be studied before an information consolidation unit is started and during the whole life cycle of the unit.

13.2 OBJECTIVES OF INFORMATION CONSOLIDATION UNITS

A clear and specific statement of objectives is required to answer the question: Towards what specific ends is a given information consolidation unit to strive? If specific ends are not clear, the ways and means cannot be effectively instituted, operated and defended.

In general, an information consolidation unit has the following objectives:

To provide for information needs

* of a given group of users,
* in relation to their given problems,
* with information from given subjects, or topics,
* contained in given information sources,
* evaluated , prepared, and supplied in a way that is appropriate to that given group of users, and
* as accomplished under given economic constraints and other social, cultural, and political requirements and values.

A specific statement of objectives requires a detailed study and specification of the aspects underlined above.

As time passes by conditions change. Thus, it is required to:

* institute a mechanism which will constantly monitor for possible changes in environmental conditions and requirements, user needs and wants, and the state-of-the-art of information work, and
* adjust the objectives and subsequently the operations according to the changes.

13.3 PROCESSES AND PRODUCTS

The basic processes in most, if not all, information consolidation units are: selection, acquisition, evaluation, analysis and synthesis of information with a view to the provision of a product or service, and their dissemination and marketing. The requirements for these are summarized below:

1. Selection requires:
    - * a selection policy (involving statement about users and needs; subject, topic, or mission to be dealt with and type of information sources and materials to be covered
    - * selection aids and tools which will guide in selection and help verification
    - * specification of a selection process (involving decisions on who selects; procedures for judging intrinsic values of information in sources; and procedures for judging demand and user appropriateness)
2. Acquisition requires:
    - * procedures for procurement of necessary information sources
    - * in cases of no outright procurement: procedures for access to sources e.g. getting on loan, photocopying pertinent sections, getting permission to use them in another information systems, etc.
3. Evaluation requires:
    - * criteria for assessing the quality or intrinsic merit of information (validity, reliability, accuracy, credibility, significance, etc.)
    - * criteria for assessing the information products and services
    - * procedures for achieving a consensus in assessments.
4. Analysis requires:
    - * specification of the topics in relation to which information will be analyzed

- a classfication scheme or a table-of-contents of the topic for organization and systemization of analyzed information
- specification of procedures for extraction of the most relevant and salient information or data
- assessment and verification of the extracted information or data by evaluation criteria described above
- sorting of extracted information into given classes or headings

5. Synthesis requires:

- comparative arrangement and evaluation of extracted information
- derivation of a consensus and resolution of possible conflicting information
- compression or merger of information into a structure and form most suited for intended users and uses
- evaluation of the final product

6. Restructuring of synthesized information requires determination of the mode in which the contents of information consolidation products will be presented to users in a way that is most compatible with situation and needs and that will enhance the comprehension and assimilation of information presented. More specifically, restructuring requires determination of:

- extent to which available content is to be incorporated
- degree of invariability of information as found in the original (i.e., whether new information value is to be added)
- degree of detail in information
- degree of changes in sequence of presentation relative to the original
- technical sophistication

- temporal presentation
- editorial qualities

In restructuring,principles of effective technical writing and scaling to audience have to be followed.

7. Packaging and repackaging requires determination of a media and format in which an information consolidation product will be presented to enhance its potential use, comprehension, assimilation, and recall. Media choices for packaging are:

- print media: print-hard copy and print-microimage
- audiovisual media: visual media-still images; visual media - moving images; audio media; and any combination of the three
- electronic media
- interpersonal contact

In packaging formats the requirement of effective formating should be followed in terms of:

- readability (comprehension where reading is involved)
- viewability (comprehension where viewing is involved)
- audibility (comprehension where listening is involved)
- identifiability (cognition and perception of key information elements)
- mnemonics (visual or audio association, particularly for recall)

8. Dissemination requires determination of the channels by which information products will be delivered into the hands of users. (Often packaging and dissemination may be combined). The choice of channels is among:

- interpersonal delivery
- group personal delivery
- strategic placement
- in-house dissemination

* mail

* local depository

* newspapers

* broadcasting; radio and TV

* telephone

* computer networks.

9. Marketing requires determination and integration of procedures for:

* market research and analysis

* segmentation of users into groups with similar characteristics. values, needs, and information benefits

* development and targeting of information consolidation products to given user segments

* user education

* promotion

* evaluation.

10. Choice of products: possible information consolidation products include:

* new announcements, newsletters

* pamphlets, brochures, question-answer sheets

* monographs, technical reports

* critical reviews, state-of-the-art reports, and handbooks

* technical guides and "how-to" booklets

* operational or maintenance manuals; specifications; standards

* recurring summaries of advances in a topic; short textbooks

* market reports; industry reports

* statistical condensates, cross-tabulations, or correlations

* briefings

* radio or TV shows

* comic strips, photonovels

* wall posters

* lectures, tutorials

* demonstrations, exhibitions

* question-answer sessions

* information 'hotline'

* prerecorded telephone messages

* referral(with assessments of the referred to party or organization)

* video newsletter

* audiovisual presentations (packages)

* videotapes, videodiscs for training

* computer online searching and manipulation of output

* viewtexts, teletexts

13.4 CONNECTION WITH OTHER INFORMATION SYSTEMS

Any and all information consolidation units require a carefully laid out connection with a number of other, larger information systems, services or networks. This is because no unit can be self-sufficient in respect to all information it needs or all information processing (indexing, data compilations, etc.) that has to be done to serve as a base for selection, analysis and other processes.

Strong connections with a library (or libraries), information centers and other information systems at home and abroad are required in order to provide for:

* access to primary literature which will not be procured

* access to indexes and other secondary sourc for searching not procured

- photocopying services
- searching for and procurement of specific items through information brokers
- procurement through jobers to fill orders
- interlibrary loan services
- computer services
- online network connections

13.5 SPONSORSHIP

An information consolidation unit requires either an outright, direct sponsorship (host) or a very close working connection with a subject or mission which in effect constituted an indirect sponsorship. An information consolidation unit cannot function without a working relation with a broader organization or mission, if for no other reason that the complexity of processes and products (outlined in the previous section) requires expert subject support and advice which cannot be possibly duplicated within the unit itself. A big problem of any and all information consolidation units is to establish a working relation with subject experts. That is one of the most impurant roles of sponsorship. Direct sponsorship in a host institution requires at minimum:

- clear specification of lines of authority and responsibility in relation to the information consolidation unit
- placing the unit so as to enable a working relationship, particularly with subject experts, within the broader organization
- giving the unit a status which will sustain such a working relationship and induce subject experts to work with the unit.

Indirect sponsorship requires at minimum:

- clear specification of the lines of cooperation, particularly emphasizing the benefits for each of the parties involved
- placing the unit so to enable a working relationship and cooperation with subject experts
- stressing the benefits of cooperation in order to sustain the working relationship and get subject experts to cooperate.

An information consolidation unit is required to:

- justify its existence and continuation to the sponsoring organization
- demonstrate its usefulness and value
- have a built in mechanism to detect and even anticipate changes in interest and plans of sponsoring organization and adjust accordingly.

Connection with a sponsoring host (organization or mission) should also enable an information consolidation unit to set its topic and coverage either not too specifically or not too broadly, as in either case the audience would tend to become too small.

13.6 FINANCING

Financing and staffing are the most difficult and vulnerable aspects of information consolidation units anyplace. Information consolidation is a costly proposition which requires adequate and sustained financing. The financial requirements are for:

1. Planning Costs:
    - feasibility studies
    - user studies - marketing research and analysis
    - design

2. Launching Costs:

    * development of functions, products, and services
    * deployment and testing
    * development of market and marketing
    * investment in facilities , tools and equipment
    * staffing and staff training and education

3. Operating Costs:

    * salaries for a director, professionals and supporting staff
    * fees for consulting experts
    * cost of procurement or access to necessary information sources
    * expenses incurred in given functions
    * marketing expenses
    * continuing education expenses for staff

Financial outlays to cover all of these expenses can be considerable. It is not unusual then to seek and establish composite funding.

For the planning and launching costs,financial assistance from national and international organizations (outside of direct sponsoring or host institution) is indispensable. Such assistance is necessary for a period from one to three years. A good proposal is required to secure the assistance, which in turn requires considerable and careful preliminary work. A good proposal shows the need, justifies the approach taken, describes methods, and demonstrates competence for carrying out the tasks, i.e. follows criteria described in Section 7.3.

For the operating costs,the unit has to rely on financial support from the sponsoring or host institution. In some instances, this support amounts to a full subsidy. However, in many other instances,after about 3-4 years from launching,cost-recovery programs have to be instituted in order to recover costs in part or even in full. The unit may have to become nearly self-supporting. In those cases,careful consideration has to be given to:

- pricing policies and price elasticity
- spreading the operating costs over a sufficiently large number of users, so that economy of scale may be working (low fees over large numbers = adequate revenues)
- strictly controlling and minimizing internal expenditures and maximizing the efficiency of operations
- pooling of resources with other information systems; establishing of resource - and operation-sharing.

Financial problems require realistic planning, such as starting at (i) a modest level with (ii) cautious and judicious function and product development, (iii) immediate stress of marketing, and (iv) involvement of experts from host institution at low or deferred cost.

13.7 STAFFING

Many information consolidation units are small, some are even operated by only one person. The staffing requirements mentioned below may have to be concentrated in one or few persons. Thus, these requirements may have to be translated into required expertise rather than treated as a required number of persons. Staffing requirements are:

- a director having management and representational capabilities, and a visionary outlook
- professional(s) with information expertise
- professional(s) with subject expertise (internal or external consultants or collaborators)
- supporting technical personnel as needed for given technical jobs.

The requirement is not to have necessarily both, the information professionals and subject experts within a unit, but to have access to subject experts as needed. That is, as already mentioned, quite often a tough requirement, because of time pressures on the subject experts. Thus, the requirement is to make every possible effort to use subject experts effectively, save their time as much as possible, and make their collaboration as easy as possible for them.

However, reliance on outside and part-time collaboration can go only so far. No unit can operate on part-time staff alone. Full-time professional staff is a necessary requirement, how many depends on the size of the effort. It is better to have information professionals as full-time,and subject experts as part-time staff, than vice versa. The best choice is, of course, to have both full-time, but that is difficult to achieve in most instances.

These are the minimum requirements for attracting and keeping permanent, competent information staff:

* adequate compensation, comparative to compensation given to other professionals in the organization
* job status (e.g. civil service scale) equal to other professionals
* benefits equal to other professionals
* opportunities for training and further professional development
* working conditions under which professionals can exercise their competence, comparable to working conditions of other professionals.

Staff training is a necessity. However, such training requires a continuous program of professional development. This can take many forms: institution of in-house courses and lectures; sending people to outside courses, meetings, conferences, lectures; cooperation with professional associations or academic institutions in starting and carrying out continuing education courses; subscriptions to professional literature and periodic discussions of readings, etc.

13.8 LIFE CYCLE OF AN INFORMATION CONSOLIDATION UNIT

Human organizations are living systems. In that sense, an information consolidation unit can be considered in relation to the phases or stages in the cycle of its life: from inception, to birth to adolescence, to adulthood and possibly to death. Each life phase has different requirements as discussed below. Adaptation of these requirements are made from Valls (13-5).

1. Preplanning or idea phase (inception). Covers the period from the time that someone has the idea for establishing the unit until a proposal for assistance is sent to a national or international organization. Requires:

  * detection of a need and problem: that it actually exists and that it is not just an assumption
  * definition of a subject or topic to be covered
  * definition of types of users to be served
  * determination of the size of the effort
  * outline of the methods and approaches to be used
  * drafting of a pre-proposal and testing the ideas with as many people as possible
  * securing the backing of a host organization for the future unit
  * searching for a funder for assistance, conferring with that organization, adjusting the proposal to requirements of the funder.

2. Planning phase (incubation). This covers the period from the time a proposal is accepted to the time a unit is physically launched. It requires:

* recruiting and training professional staff

* securing a location and facilities of easy access for experts and users

* securing expert consultation

* dealing with the management aspects, including lines of authority and responsibility

* conducting a user study and market analysis

* establishing an advisory board and using it

* drawing up a full definition of choice of subject or topic covered and of the size of the effort

* getting the necessary tools and equipment

* designing processes, products, services, and preparing specifications for associated evaluative criteria and working procedures

* planning of marketing,including evaluation of products and services

* testing and adjustments

* establishing connections with other information systems.

3. Launching phase (birth). Includes the period extending from the announcement of the services until the time when users start reacting. Requires:

* effort to create a wide awareness of the units existence and of the potential benefits to be derived from using its products and services

* promotion, user education, travels, visits, demonstrations, etc; in order to achieve high visibility and open lines of communication

* launching all operations and producing first products and services

* immediate positive (non-defensive)reaction to any questions, complaints, criticisms

* strengthening connections with experts

* continuing staff training with adjustments as necessary

* reporting to funder
* showing results to sponsoring organization.

4. *Adjustment or first operational phase (infancy)*. Covers the period extending from the first user reaction to the provision of products and services and to the satisfactory execution of routine operations. Requires:

* evaluation of user and market reactions
* shake-down of all operations, and adjustments as necessary, reassignment of staff
* increased attention to quality control in all operations, products and services
* creating trust and confidence in users
* strengthening connections with other information systems: routine conduct of exchanges and resource - and operation - sharing
* expansion of marketing
* consideration and development of new products
* showing results to professional colleagues
* showing benefits to sponsoring organization.

5. *Expansion or second operational phase (adolescence)*. Covers the period extending from the attainment of full operations status to the achievement of a relatively high growth rate. Requires:

* continuing evaluation and reevaluation and initiation of necessary changes
* shifting attention from routine operations to continuing and intensified marketing and recurring contacts with increased numbers of users
* increased attention to efficiency of operations, minimizing costs and maximizing performance

- launching of new products and services
- opening avenues to new users (late adopters and laggards)
- preparing cost-recovery programs and
- reexamination (and if necessary readjustment) of relations with subject experts; seeking of new groups of experts on a rotational basis
- rotation of advisory board

6. Self-sufficiency or third operational phase (maturity). Covers the period from achieving relatively full market potential (high growth rate) to the battle for continuous existence and survival, and to relative lower growth rate or even steady state. Requires:

- continuing evaluation, reevaluation and adjustment to changing environmental conditions and changing user needs
- achieving financial cost-recovery programs as planned, adjustments as necessary
- launching new products and services; improvement of old ones; mandatory abandonment of less useful products
- increasingly cultivating user contacts and trust; leaving nothing to routine with users
- new training and professional development efforts for new staff; continuing education for all staff
- continuing marketing, but with new marketing approaches.

7. Possible discontinuance (death): an information consolidation unit can be terminated of its own accord because of inadequate budgets, performance, and/or internal failures, however, there are cases when the unit is closed. because of other objective reasons such as:

- sponsoring or host organization changed interests as to subject or topic and the information is no longer needed

- the pace of the activity in a technical area of information coverage slackens i.e there is no information to consolidate
- the information became available within reach of the user community on its own
- the urgency of information needs has gone.

13.9 EVALUATION

Evaluation of products, services and operations of an information consolidation unit is required on a continuing basis.

The criteria that users tend to apply in evaluation of information products are discussed in Section 7.6. Briefly, the users place value on:

1. Quality of information (or data) provided (precision, accuracy, credibility, recency).
2. Scope of information provided: (completeness, comprehensiveness, coverage of topic).
3. Appropriateness to their need or request (fitting the need, level, language, sophistication; degree of spurious information and information overload; understandability; ease of use).
4. Hassle in getting the information (timelag , paper work, ease of access, red tape, support received).
5. Costs including direct price paid, hidden costs in using the product or service, time required in assimilation of information.

Ranking in priority of any of these criteria may differ from user to user and from time to time; thus, user evaluation is not a fixed 'number' or value in space or time in relation to a given product or service. These 'floating' evaluation patterns should be recognized, thus many and continuing evaluations need to be done to recognize some predominant direction or recurring pattern.

Instruments designed for evaluation by users should include the enumerated (and possibly other) user-valued factors rather than those dealing with internal concerns of a system or organization.

However, the ultimate evaluation by users should not be considered in terms of any of the aspects that deal directly with a given information product or service. The ultimate evaluation is in terms of the benefits received: increased productivity; increased well-being; better life; more comprehensive understanding of a problem, action, or consequence; more certainty in decision making; easier actions; promotion; healthier surroundings; etc. etc. All of these are benefits that are very hard to pinpoint, uncover and for the most part impossible to quantify. Non-economic or non-monetary values are often present (as discussed in Section 3.6.). Thus, an ultimate evaluation requires consideration of these aspects.

There is a general agreement that the value of information is extremely difficult to quantify, and where quantification is attempted it can be done only through indirect estimates or anecdotal evidence, but, unfortunately, not through direct observations and the determination of a cause-effect link. The present state of methodology simply does not allow for true quantification, and for rigorous valid and reliable observation of economic cost-benefits or of information products and services, even though they may be required and desirable. Search for cost-benefits is a search for some estimate or other, often of an almost speculative nature.

These factors contribute to the success of an information consolidation unit.

1. Sound understanding of users: evaluation of user and market needs,

wants and dynamics; ability to fit with those needs and adjust to dynamics.

2. Relative uniqueness of products or service provided - in their features, reliability, access, costs, appropriateness and efforts.
3. Relative technical superiority - in accuracy, timeliness, completeness, consistency, packaging.

At the end, the rate of satisfied customers in proportion to the customers served, or even better: in proportion to the total number of customers that could be served in a given segment, may be the most appropriate and achievable evaluative measure.

Over a decade ago (in 1970) in surveying the effectiveness studies of information analysis centers (IAC) in the USA, Wooster (13-7) listed these criteria which may also be applicable at present, at least to some extent, to the evaluation of information consolidation units (Wooster warned that these are randomly listed without assigned priorities):

"1. What percentage of possible users does the IAC serve?
2. What is the cost of making a search?
3. Does the retrieval system provide the proper amount of exhaustivity and selectivity per dollar and per request?
4. What are the economic or "opportunity" costs that would be incurred in the absence of IAC?
5. Do scientists [users] in the field believe that the IAC meets their needs?
6. To what extent do references to the service provided by the IAC occur in the literature of the field?
7. Output of specialized reports.
8. Professional qualifications of manager, staff.
9. Does it meet the specific needs of the sponsoring agency?
10. Percentage of repeating users. Are these regularly surveyed to determine adequacy of information provided?
11. Were prospective users surveyed before center was started?
12. What alternative sources of information would be available to users if, Heaven forbid, the IAC were abolished?
13. How much interaction is there betweeen users and IAC staff in formulating questions and evaluating answers?
14. 'Incest Quotient' (IQ): Does the IAC have an outside advisory board? Does it use them or are they just window-dressing?
15. IQ continued, What are their relations to other IAC's? Do they refer questions to other IAC's, receive questions from them?

16. Still more IQ. Do they exchange computer programs, vocabularies with other IAC's? Is there any attempt at networking? If so, which IAC initiated it?
17. Are the detailed unit operations - acquisitions, indexing, abstracting, storage, retrieval, output formatting, etc. efficient? How well do they know their unit costs? How do these compare with other IAC's?
18. What is the rate of use of documents and other information resources involved in the center?
19. How willing are the customers to pay for the service provided?
20. Which came first - the IAC or a demonstrated need for its services?
21. How sharply defined is the field that the center covers?
22. Does the center take advantage of available services for information retrieval, including other IAC's?
23. Is the storage system reasonable in view of the available hardware and size. Does the IAC strike the proper balance between computer-philia and phobia?
24. Are micrographic storage and dissemination methods used wisely?"

13.10 ANATOMIES OF FAILURE

In the examples presented in other Chapters we have been dealing with either possible or successful applications. Here we will deal with factors that contribute to failure of information consolidation. Failures in any information system were never as much analyzed as successes, thus there is so much less to draw from.

However, there is some consensus as to what may contribute to failure:

* No market for product or services
* Market is dynamic, product or service is not
* Product and services designed for information specialists or librarians, not users
* Same service or product available elsewhere under better conditions
* Price is too high; hidden costs in use are too high; too time consuming to use
* Difficult to obtain, access, use; easier to be without information than use products or services of the unit

- Lack of direct link with an information producing or 'consuming' institution (operating laboratory; research and development facility; health, agricultural...agency, etc.) and consequent inability to stay in the forefront of the interests of technical community
- Related technical programs are terminated and no adjustment to other programs can be made
- Lack of effective director
- Inadequate staff; or too small a staff
- Inadequate economic and technical support and resources; budget is too small
- Vis major: usually political upheavals.

Also over a decade ago (in 1968) the U.S. Committee on Scientific and Technical Information made a study of the failures of certain information analysis centers (13-2). The conclusions are worth recounting:

> " A center in operation for 1 1/2 to 2 years was reviewed by the sponsoring agency along with other centers for its performance according to six criteria: acquisition program, inputs to an abstracting and indexing publication, effectiveness and efficiency of internal operations, quality and utilization of the Advisory Board, output of specialized reports, visibility, and penetration of user community. The subject center was rated low on all counts. The local management situation of the center was such that substantial improvement could not be expected in the immediate future. Accordingly, the center was closed down, and its file returned to the sponsor to be relocated at another facility.
>
> A center active for fifteen years under multiple agency support had provided excellent literature support service in the technical area considered the most important when the center was established. The center had no direct link with any laboratory or operational R & D facility and thus was insulated over time from the changing interests of the technical user community. The center found it difficult to shift to new technical areas in response to evolving sponsor and user requirements. When a tight budget caused the sponsors' agencies to review carefully their roster of projects all sponsors placed this center low on

> the priority list. Basically unwieldy, the multiple funding arrangement by research organizations offered no single enthusiastic advocate of a center where most of the users were applications oriented.
>
> A center started its own information analysis activities without sponsorship, because of the director's strong scientific interest in the subject. His high professional reputation in the field, and the center's potential for serving the general user community led to sponsorship. However, the agency division which provided the initial funds had only limited funds to permit the center to develop a complete program. Accordingly, responsibility for support was changed to a different agency division.
>
> There were at least three factors which, in combination, brought about the closing of this center:
>
> 1. The division personnel as research oriented program administrators, did not feel the need for the information and data the center was providing to bench scientists and engineers.
> 2. The center was not funded at a level sufficient to enable it to prepare state-of-the-art studies and to provide critically evaluated reponses to inquiries. If these products and services had been forthcoming during the start-up period, the program division might have seen the value of continuing the center.
> 3. The attempt to transfer funding to the program division came in a tight budget period. The division has not made any plans to assume the funding."

In summary, information consolidation requires not only a study of options and successes but also of failures.

13.11 CONCLUSION

The general aim of this *Handbook* is to contribute to the art of information handling by trying to provide a better understanding of concepts, processes, and options of specific information practices called information consolidation which are leading to a widening of the population of users served.

The Handbook provides a general model of what is meant by,and what is involved in,information consolidation. This model is in effect summarized in this, the last Chapter. No doubt the model can and should be refined or modified, particularly when it comes to specific instances, subjects, environments and implementations. In other words, the model offers only a general framework for,and a description of options in,information consolidation, but not prescriptions. In each specific case of implementation, astute judgements and creative decisions have to be made on the specific information consolidation practices, products and services as appropriate to specific users, requirements, and environmental conditions.

Information consolidation is neither a panacea for information needs and problems in development nor a substitute for many other information efforts. It is just one approach in the whole spectrum of information practices needed for various aspects of development. However, information consolidation is a very effective approach to the fulfilment of specific information needs for evaluative and synthesized information and to the service of the unserved. As the examples in this Handbook have shown, information consolidation is applicable to highly sophisticated users - scientists, engineers, managers, policy-makers, as well as the users of lesser sophistication - workers, villagers, school children. The choices are wide. They can be made only on the basis of priorities and values in specific developmental efforts and environments.

Information transfer and communication have proven to be essential for development, for social change. In turn, information consolidation has proven its high effectiveness and potential for information transfer and communication. Regardless of its complexity, information consolidation should be given a high consideration in the institution or refinement of information efforts serving development.

Yes, information consolidation is complex. But, it involves complexity in processes only, whereas in products and services it offers simplicity and appropriateness. This is the secret of the value and high potential of information consolidation as an information transfer mechanism in development.

APPENDIX 1

EXAMPLES OF INFORMATION ANALYSIS CENTERS AND THEIR PRODUCTS

As suggested in Chapter 8, information analysis centers exist in a wide variety of subject areas and missions. A _sample_ of such centers along with some of their methods and products (as far as these could be determined from materials received by the authors) are given below:

1. _Science_

Cambridge Crystallographic Data Centre
University Chemical Laboratory
Lensfield Road
Cambridge CB2 1EW, England

Method: journals and abstracts of two major crystallographic conferences are scanned, relevant articles copied, and bibliographic and other data abstracted and transferred to a computerized file which is used in critical evaluation of the numeric data

Products: series of standard reference volumes called _Molecular Structures and Dimensions_ which include numeric data compilations

2. _Engineering and Technology_

(1) Asian Institute of Technology
(four information centers listed below)
P.O. Box 2754
Bangkok, Thailand

Method: provides advanced education in engineering, science, and allied fields through academic programs and research; problem oriented approach aimed at finding appropriate solutions to Asian problems through the four specialized centers

General Products: A Guide to Setting Up a Technical Information Service Unit; Division of Energy Technology's illustrated booklets in English and Thai; Information Update; see also other divisions below

(1a) Asian Information Center for Geotechnical Engineering

Method: acts as a clearinghouse for information on soil mechanics, foundation engineering, rock mechanics, engineering geology, earthquake engineering, highway engineering, soil science, groundwater hydrology, and related fields

Products: AGE news (a newsletter giving information on future events, new publications, on-going projects, reports by liaison officers in many countries, news of AGE's operations, etc.) AGE Current Awareness Service; Asian Geotechnical Engineering Abstracts (abstracts of geotechnical publications originating in Asia; abstract includes author, title, source, abstract, and keywords); state-of-the-art articles written by specialists on geotechnical engineering topics; AGE Digest (printed version of computerized data base, classified by the International Geotechnical Classification System and published in a series of booklets corresponding to the various classes)

(1b) Environmental Sanitation Information Center

Method: attempts to find ways of bringing relevant information to rural users with little education; is working to build up a comprehensive collection of documents in the field of environmental sanitation; is establishing contacts and cooperation with existing centers, organizations, and individuals in the field in an endeavour to meet the information needs of developing countries not being met by other information facilities

Products: bibliographic bulletin, quarterly newsletter *Enfo* presenting news of relevant activities in various parts of the world, current research and results, information sources, recent and forthcoming events, annotated list of documents received, and announcements; *Environmental Sanitation Abstract: Low Cost Options*; an annual technology review; occasional simple brochures; booklets translated into various languages

(1c) International Ferrocement Information Center

Method: serves as a clearinghouse for information on ferrocement and related materials; attempts to collect information on all forms of ferrocement applications, either published or unpublished, and to repackage and disseminate this information as widely as possible through its publication, reference, and reprographic services

Products: *Journal of Ferrocement* containing papers on research development, applications, techniques, annotated bibliographies, news, notes, information on international meetings, and book reviews; state-of-the-art monograph, *Ferrocement* by B.K. Paul and R.P. Pama; *Ferrocement and Its Applications: A Bibliography*, classified according to subject; a number of "how to do" booklets (for example, Ferrocement Grain Storage Bin, an illustrated booklet showing two designs of grain storage bins and describing details of construction in non-technical language by P.C. Sharma and V.S. Gopalaratnam); reprints of report, The Potentials of Ferrocement and Related Materials for Rural Indonesia: A Feasibility Study by R.P. Phomratanapongse; pamphlet FOCUS, in many languages, introducing ferrocement as a form of concrete useful in construction with a minimum of skilled labor

(1d) Renewable Energy Resources Information Center

Method: attempts to improve awareness of available information on renewable energy resources and to clarify the applicability of existing appropriate technologies; solicits information, news items, and state-of-the-art papers from readers in an attempt to build up a comprehensive collection of documents in the field of renewable energies; attempts to answer renewable energy questions in terms of appropriate technology as judged by expected user requirements; is establishing contacts and cooperation with worldwide organizations and centers active in solar and other renewable energies, giving special emphasis to relations with institutions, firms, and individuals in tropical Asia and the Pacific; attempts to determine and meet information needs in that region by having potential users complete questionnaires

Products: RERIC News, giving news of activities at the center and around the world, annotated listing of publications received, on-going projects, new equipment, coming events, announcements, etc.; Renewable Energy Review Journal containing state-of-the-art and review papers of high quality but at a modest academic level; Abstracts of AIT Reports and Publications on Renewable Energy Resources; brochures or booklets in English and various local languages such as Solar Rice Drying, an illustrated booklet giving design and construction details in a simplified way to be applied at the local level; may translate other publications into several Asian languages

(2) Clearinghouse on Development Communication
1414 22nd Street, N.W.
Washington, D.C. 20037 USA

Method: maintains a specialized collection of print and non-print materials; provides referral services plus materials and information on developments in application of communication technology to development problems

Products: newsletter, Development Communication Report covering recent worldwide development activities that use communications media (for example, "To and From the Field: Communications and Agriculture" in a recent issue); a series of project profiles, two-page descriptions of communication projects dealing with problems in the development sectors of agriculture, nutrition, population, health, education, human resources, and integrated development (for example, Satellite Application for Public Service: Project

Summaries) published to increase access to information on projects in the developing world which other countries may want to consider adapting to their problems; a series of information bulletins treating in depth and usually on a comparative basis, the applications of communications media to major sectoral and multi-sectoral development problems (for example, Tele-Niger: Adapting an Electronic Medium to a Rural African Context); films; audio and video tapes; special reports (for example, Educational Technology and the Developing Countries: A Handbook, available in French and Spanish)

(3) Concrete Technology Information Analysis Center
U.S. Army-Engineer Waterways Experiment Station
Box 631
Vicksburg, MS 39180 USA

Method: gathers, analyzes, evaluates, condenses, and publishes reports on concrete technology

Products: state-of-the-art reports (for example, "Factors which Influence the Deterioration" of Concrete in Dams and Measures for Prevention of Deterioration by Bryant Mather); summary papers (for example, "High Strength, High Density Concrete" by Katherine Mather); miscellaneous papers (for example, "Concrete for Earth-Cooled Structures" by James E. McDonald and Tony C. Liu)

(4) Electronic Properties Information Center
Purdue University
2595 Yeager Road

West Lafayette, IN 47906 USA

Products: data sheets, special study reports, interim reports, computer generated bibliographies, bulletins, state-of-the-art reports

(5) Institute of Electrical Research
Department of Technical Information
Apartado Postal 1239
Cuernavaca, Morelos
Mexico

Method: selects information in a number of areas of electrical engineering from around the world; has staff of about a dozen engineers and a half dozen librarians; engineers work with the 300 professionals within the institute and regularily visit electrical institutions around the country; services organized according to external and internal users; engineers primarily oriented to external users, librarians to internal users; external services organized around some subject (for example, motors and generators; transformers; plant construction; plant operation; geothermal energy; etc.); electrical engineers visit plants and centers in these subjects, interview users, and provide three basic services: 1) current awareness, 2) retrospective searching of data bases available through Mexico's SECOBI online system (connected to Lockheed, SDC, and other data bases) with results screened and only the most relevant sent in a folio including a short abstract summarizing all retrieved documents, and 3) question answering (provision of specific facts, addresses, data, etc.

obtained from searching various reference tools or consultation with specialists)

Products: current awareness bulletin Referencias in subject areas mentioned above—each comprised of about 3-4 annotated (in Spanish) citations of relevant articles selected from the journals, proceedings, reports, etc. received by the institute library (upon request users are furnished with copies of articles listed in the bulletin); translations (or reprint, if in Spanish) of an article deemed of interest to users often included with Referencias

(6) International Irrigation Information Center
P.O. Box 8500
Ottawa, Canada
or
Volcani Center
P.O. Box 49
Bet Dagan, Israel

Method: brings together experiences of diverse groups working in irrigation; extracts information to produce structured abstracts with systematic, pre-set format but does not critically evaluate information currently; provides photocopying, translation services, and information aimed at enhancing irrigation progress, especially in developing countries; solicits comments from users

Products: abstract journal aimed at helping readers assess the value of the original material before they seek it out;

state-of-the-art review book series (for example, Quality of Irrigation Water); handbook Small Scale Irrigation by Peter H. Stein; newsletter Irrinews in English and Spanish; directories; catalogues; guides; Irricab: Current Annotated Bibliography of Irrigation; fliers

(7) International Technical Information Network
Office of the Director, Developing Countries Staff
Suite 620, 425 13th Street, N.W.
Washington, D.C. 20004 USA

Method: cooperative association of information organizations sponsored by USAID and organized by the National Technical Information Service of the U.S. Department of Commerce to expedite transfer of U.S. scientific and technical information and to make information originating in developing countries as accessible in these countries as technology from developed countries; holds conferences and workshops

Products: abstract newsletter with guest editorship editions by member agencies

(8) Machinability Data Center
Metcut Research Associates, Inc.
3980 Rosslyn Drive
Cincinnati, OH 45209 USA

Method: analysis by experts of data extracted from articles, reports, tests, etc. and repackaging into various products

Products: Machining Data Handbook; MDC Machining Process Series including Machining: A Process Checklist; Nontraditional Machining Guide; Chemical Machining: Production with

Chemistry; Low Stress Grinding for Quality Production; Group Technology: An Overview and Bibliography; data compilations; computer programs; programmable calculator strips; Machining Briefs containing technical notes (for example, "Small Hole Manufacturing" in a recent issue) for use in shops and industries plus announcements of interest

(9) Mechanical Properties Data Center

(9) Battelle Laboratories
505 King Avenue
Columbus, OH 43201 USA

Method: continuously acquires, reviews, and analyzes documents from government agencies and contractors plus published and unpublished data from private industry, research centers, and universities; extracts data from relevant documents and enters it into computerized data bank (bank consists of measured test results and descriptive information for over 1 1/2 million mechanical property tests, including non-numeric descriptors related to material processing, fabrication, test procedures, composition, and other pertinent variables); retrieval and dissemination of mechanical properties of metals and alloys

Products: Structural Alloys Handbooks plus supplements; Aerospace Structural Metals Handbook plus supplements; Alloys Cross Index

(10) Metals and Ceramics Information Center
Batelle Laboratories
505 King Avenue

Columbus, Ohio 43201 USA

Method: calling upon the knowledge of scientists and engineers throughout the Battelle staff, acquires, reviews, analyzes, evaluates, and extracts documents for input into data base; disseminates timely and authoritative information on the characteristics and uses of advanced metals, ceramics, and selected composites; provides advice and assistance; provides access to over 100,000 analyzed and indexed reference sources; as needed by users, does in-depth review and analysis of technical literature in highly specified areas, compares foreign and domestic technology, organizes conferences and symposia, and publishes proceedings; includes user evaluation sheet in all publications for user feedback

Products: handbooks/databooks (for example, Damage Tolerant Design Handbook and Engineering Property Data on Selected Ceramics); state-of-the-art reports (for example, "Cracks at Structural Holes"); conference proceedings (for example, Proceedings of the 1978 Triservice Conference on Corrosion); critical reviews or technology assessments (for example, A Review of the Status, Selection, and Physical Metallurgy of High Strength, Low-Alloy Steels); CAB Current Awareness Bulletin, a digest giving important facts and data from articles or reports being abstracted; summaries of important developments in metals and ceramics technology

(11) National Academy of Sciences (NAS)
National Research Council (NCR)

2101 Constitution Avenue
Washington, D.C. 20418 USA

Method: Advisory Committee on Technology Innovation (ACTI) of the NAS/NCR's Board on Science and Technology for International Development (BOSTID) seeks out, investigates, and publishes reports in science that are original, unconventional, exotic, or neglected (including innovative subjects that could benefit developing countries); ACTI generates and reviews ideas for new studies and selects the most relevant ones based on such criteria as potential benefit to developing countries (especially the rural poor), practicality, scientific soundness, interest to USAID missions, innovativeness, and appropriateness for NAS treatment; ACTI helps staff select chairpersons and panelists for ad hoc panels to do studies (each panel is uniquely qualified for its topic, including representatives from a wide array of disciplines plus researchers from developing countries); panel meets once or twice to debate topic, draw conclusions about its relevance to developing countries, and consider the research or testing needed for application; reworked drafts are edited, returned to panel for review, and, before printing, further checked by independent reviewers for completeness, scientific validity and balance; ACTI and staff ensure reports are accurate, clear, well illustrated, and up-to-date; when published, copies of reports are sent to USAID missions, appropriate U.S. embassies, foreign embassies in Washington, and often to hundreds of universities, libraries, research institutes, and U.N. agencies as well as to technical assistance organizations in Europe, Canada, Australia, New Zealard, etc.; NAS prepares press releases about reports for news media; most reports include tear-out mailers, so readers can obtain copies; ACTI tries to ensure that reports are acted upon by giving executive summaries and summaries in French and Spanish (Arabic and Portuguese in two cases), as well as using enough illustrations and captions so messages can be understood at a glance, plus listing on the reports addresses of specialists who can provide more detailed advice or materials; BOSTID also provides workshops, seminars, advisory teams, long-term programs special studies in addition to those of ACTI, plus providing AID and other interested agencies with access to the latest information and thinking on development topics; NCR Project on Transportation Technology Support for Developing Countries provides improved access to information on planning, design, construction, and maintenance of low-volume roads (information products defined, produced, and transmitted via network of correspondents in 67 developing countries who promote effective use of information in economic development of transportation infrastructure, thus enhancing other aspects of rural development through personal interactions with users in the field, conferences, publications, and several other forms of communication)

Products: state-of-the-art reports in conjunction with seminars (for example, "Two-Way Communications for Rural Health Services in Developing Countries"); BOSTID reports (for example, "Aquatic Weed Management: Some Prospects for the Sudan and the Nile Basin"); ACTI reports offering guidance for individual problems throughout the developing world (on subjects as diverse as house construction, boat building, energy, nutrition, renewable industrial resources, and pest control) generally aimed at stimulating ideas and introducing new topics to decision makers in government, administrators, research institute directors, researchers in neighboring disciplines, voluntary groups, graduate students, entrepreneurs, industry executives, and farmers (for example, "Underexploited Tropical Plants with Promising Economic Value" and "The Winged Bean: A High Protein Crop for the Tropics")

(12) National Solar Heating and Cooling Information Center
P.O. Box 1607
Rockville, MD 20850 USA

Method: maintains extensive files on all aspects of solar hot water heating and computerized file of solar energy equipment manufacturers and distributors

Products: booklets, for example Solar Hot Water and Your Home

(13) Nondestructive Testing Information and Analysis Center
Southwest Research Institute
6620 Culebra, P.O. Drawer 28510
San Antonio, TX 78284 USA

Method: determines needs and structures searches; verifies search strategies; searches NTIAC/NTFILE, DDC/TRFILE, WUFILE, and commercial files; forwards search strategies, printouts, and annotations to requestors; continuously surveys open literature of the world; consults technical staff of Southwest Research Institute; maintains computerized literature file on all aspects of nondestructive evaluation plus access to other computer file; supports technical conferences, commissioned studies, etc.

Products: NTIAC Newsletter; custom bibliographies in response to technical inquiries where information sought goes beyond bibliographic citations; state-of-the-art surveys (for example, "Electromagnetic Acoustic Transducers"); technical assessments and critical reviews tailored to user requirements; NTIAC Handbook; Proceedings of the 12th Symposium on Nondestructive Evaluation; report guides

(14) Plastics Technical Evaluation Center
Pictinny Arsenal
Dover, NJ 07801 USA

Method: specialists reduce raw data to user's specifications and supplement them with unpublished information which refines and updates the published data; evaluate documents for retention and if retained index, abstract, and put them into data base

Products: PLASTEC Reports giving citations, abstracts, and procurement information; handbooks (for example, Engineering Design Handbook: Joining of Advanced Composites)

(15) Regional Centre for Technology Transfer
Manickvelu Mansions
49 Palace Road, Po[illegible] Box No. 115
Bangalore 560 052 India

Method: scans journals, reports, books, and other information materials; selects, adapts, repackages, and disseminates information to several types of end users (policy makers, planners, administrators, entrepreneurs, regulating agencies, R&D institutions, and industrial development agencies) in ESCAP (Economic and Social Commission for Asia and the Pacific) region

Products: technical digests of information on activities of developing countries in ESCAP region (for use in promotion, research and development, development of technological capabilities, and new technological developments) in the form of research round-ups, technical notes, etc. covering areas identified as important by countries of the region; answers to specific questions provided from information collected and repackaged by the Technical Information Enquiry Service; special publications (of materials presented at workshops, seminars, or consultation meetings) [illegible] specific sectors or subjects; newsletter describing activities in technology development and transfer in developing countreis of the ESCAP region

(16) Reliability Analysis Center
Rome Air Development Center
Griffiss AFB, NY 13441 USA

Method: maintains and offers to users comprehensive electronic component reliability data and information plus direct consultation, seminars, workshops, tutorial courses, and search services

Products: critically evaluated data compendia (for example, Digital Failure Rate Data); survey study reports; Reliablilty Design Handbook; Electrical Overstress/Electrostatic Discharge (EOS/ESD) Symposium Proceedings; RAC Newsletter; technical reliability studies (for example, Microcircuit Wire Bond Reliability)

(17) Small Industry Extension Training Institute
Yousufguda
Hyderabad 500 045 India

Method: library maintains wide range of books on economics, small industry, management, finance, technology, etc. plus over 1200 periodicals; provides massive classified information on several topics; attempts to assist in promotion and modernization of small industries through training, research, and consulting activities in the fields of small industry development, management, and extension; national documentation center caters to information needs of small industry

Products: international meeting program announcements; massive classified information on several topics enabling preparation of lessons, feasibility reports, product profiles, etc.

(18) Soil Mechanics Information Analysis Center

U.S. Army-Engineer Waterways Experiment Station
Box 631
Vicksburg, MS 39180 USA

Method: announces availability of rock and soil mechanics information; abstracts and rates reports and may give brief evaluation statements

Products: literature surveys, state-of-the-art studies, Evaluation Statements and Abstracts of Recent Acquisitions on Soil Mechanics and Related Subjects

(19) Solar Energy Research Institute
1536 Cole Boulevard
Golden, CO 80401 USA

Method: plans and carries out research and commercialization activities in solar energy technologies (active and passive solar heating and cooling, solar thermal, photovoltaic, wind, biomass, and ocean thermal)

Products: national Solar Information Data Bank (to provide online as well as other response modes for all areas of solar energy information); brochures aimed at helping people find needed information on solar energy technology; newsletters planned to look at research areas, legal interests, and consumer interests

(20) Technical Assistance Information Clearing House
American Council of Voluntary Agencies for Foreign Services, Inc. (ACVAFS)
200 Park Avenue South
New York, NY 10003 USA

Method: operated by ACVAFS—a confederation of member voluntary agencies providing a forum for cooperation, joint planning, and exchange of ideas and information in order to avoid duplication of effort and assure maximum effectiveness of relief, rehabilitation, and development programs of American voluntary agencies; three standing functional committees serve as instruments for exchange and joint planning; ad hoc committees are established as needed; member agencies use the Council in joint approaches to govermental and intergovernmental institutions in dealing with refugee, disaster, and development problems in the developing countries; keeps files of information on U.S. voluntary agencies, missions, and foundations and their overseas development assistance programs; maintains relevant directories, books, periodicals, and reports

Products: TAICH Newsletter; annotated bibliographies (for example, A Bibliography on Evaluation, Needs Assessment, and Project Design for Overseas Development Programs); annotated acquisitions list; Country reports (for example, Development Assistance Programs of U.S. Non-Profit Organizations: Angola); TAICH Directory, indexed by agency name, country, and category of assistance

(21) Technical Information Service
National Research Council of Canada
Ottawa, Ontario K1A 053 Canada

Method: experienced engineers analyze articles in international technical publications selecting articles relevant to

Canadian manufacturing conditions and requirements and give these articles descriptive titles; provide information needed in decision making in order to advance technical and related operations while reducing unwanted information

Products: Canadian Subject Retrieval Program (list of subjects from air conditioning to woodworking mailed to executives for selection of subjects of interest; list of selected titles covering a 5-year period sent on each subject requested; titles selected by clients sent by mail in the form of technical articles called Tech Briefs); Canadian Technological Awareness Program (manufacturers register their interests and computer-selected individualized lists of Tech Briefs titles are sent to them monthly; selected items sent by mail); Canadian Audio Cassette Tapes (clients supply cassettes on which speech-compressed audio messages are recorded and returned for use in employee training, motivation, etc.); Reference Guides; Canadian Government Information Sources (listed by subjects of interest to industralists)

(22) Technological Institute
Gregersensvej
DK-2630 Tastrup
Copenhagen, Denmark

Method: attempts to develop, adapt, and transfer new technology in support of trade and industry via an inquiry service, consultancy, testing, education, job training, and research and development; highly flexible approach to probelm solving, tailoring activities to specific needs of clients (small and medium-sized industries and Danish authorities); various departments address specific needs of certain trades such as automotive, building, chemical, foundry, machine, plastics, tanning, and woodworking industries; also addresses more general problems such as automation, management, pollution control, and working conditions; staff participates in several technical assistance programs abroad, for example, establishment (in a joint venture drawing on local expertise in early analysis and planning stages and on Institute know-how in construction and operating phases) of two industrial training centers in Kenya and a school for cabinet makers in Tunisia

(23) Technonet Asia (Asian Network for Industrial Information and Extension)

Room 703, REIC International House
30 Orange Grove Road
Tanglin P.O. Box 160
Singapore 9124

Method: cooperation of 13 organizations in 10 Asian-Pacific countries to improve the quality and efficiency of production in small and medium scale industries by sharing information and technology, training of extension officers, holding workshops and regional meetings for exchange of information, referral, and interchange of extension and information personnel; gives emphasis to application of knowledge concerning known processes, methods, techniques, equipment, modifications, and approaches to existing operations effected by the transfer of technical information and provision of industrial extension services; supports state-of-the-art reviews; provides current awareness services; establishes links with specialized information sources; develops training in self-reliance and direct networking; identification and motivation of indigenous entrepreneurs and the appropriate education of these people in proper use of technological information

Products: newsletter, digest, pamphlets, films and other AV materials useful to the extension worker; roving seminars on selected industries (fruit and vegetable processing, wood furniture, metalworking); a guide to setting up a Technical Information Service unit; papers (for example "Technology and Small Industry Development--Some Premises" by Leon V. Chico); Appropriate Technology Series (for example, Steam Generator for Rattan Forming)

(24) TECHNOTEC--Technology Exchange Service
Control Data Corporation
P.O. Box 0
Minneapolis, MN 55440 USA

Method: provides spur to new business by making existing technology available on a worldwide basis; participants enter their information into TECHNOTEC data base, making it instantly available to other users; users list their technology, both items for sale and items wanted, and search the data base for varied business opportunities; data are not compiled by administrators but provided by participating individuals and organizations; users offering technology for market submit descriptions of ideas, existing processes, patents of information about related products, services, and expertise; users seeking technology supply description of product or service needed; when offers are no longer valid, they are removed from file, ensuring current data; users search data base by entering keywords related to information needed; system matches customer keywords to information available; when data of interest located, user may request more detailed information and the identity of the source; no previous computer knowledge or experience required; customers charged for amount of information they store on the file and for the amount they retrieve; customers may access data base from interactive terminals in their own offices, linked by local telephone to the CYBERNET Services network in North America, Europe, and Australia; TWX and TELEX lines provide additional interactive service throughout the world; a personalized customer search service center serves customers without terminals or those who need assistance

Products: data base of technologies (available to inventors, small firms, large corporations, and governments); TECHNOTEC Newsline, including articles of interest from a variety of views plus "Techno-bank Update")

(25) Thermophysical and Electronic Properties Information Analysis Center
Purdue University
2595 Yeager Road
West Lafayette IN 47906 USA

Method: systematic literature search of abstract and technical journals; documents received are microfiched, thoroughly reviewed, and pertinent information is extracted and translated into mnemonic code onto coding form; substance is assigned a classification number and coded form is processed by computer for storage and retrieval; compilation of data tables

Products: literature retrieval guide, data tables, state-of-the-art reports, critical reviews, national standard reference data series, master's theses' titles, reference set on high temperature solids, handbooks, data books, technology assessments, newsletter, promotional brochure, documentary film

(26) U.S. Department of Energy Technical Information Center
P.O. Box 62
Oak Ridge, TN 37830 USA

Method: publication of selected energy-related materials

Products: symposium series, energy-saving booklets, translations for non-English speaking citizens (for example *Consejos para Ahorrar Energia*)

3. Agriculture

(1) Centro Internacional de Agricultura Tropical
(two centers listed below)
Apartado Aerev 6713
Cali, Colombia

(1a) Cassava Information Center

Method: maintains the world's most complete collection of literature on cassava; working with this collection, information scientists, documentalists, translators, bibliographers, etc. (in close collaboration with the scientific researchers of the Cassava Production Systems Program) perform in-depth analysis of information to provide abstracts and keywords or descriptors; classification of abstracts into broad categories for easier use; solicits from users their published papers, internal documents, progress reports, and correspondence containing information of possible use to other researchers; provides a system of coupons to facilitate purchase of products and services

Products: monographs (based on extensive collection of documents) which critically analyze research in cassava by areas of knowledge (for example, Cassava Pests and Their Control); manuals (for example, Cassava Drying and A Cassava Harvesting Aid); reproductions and translations of articles, newsletters presenting in pleasant, easy to read format current worldwide cassava research and cultivation activities (for example, the recent application in Brazil of cassava to extracting alcohol to mix with gasoline) plus information on new publications and upcoming technical meetings; a cassava workers directory; cards and cumulative volumes in English and Spanish containing abstracts or summaries aimed at giving potential users a better idea of whether they should read the entire article; Cassava Thesaurus

(1b) Bean Information Center

Method: similar to Cassava Information Center except deals with specialized literature on beans under tropical conditions

Products: monthly abstract cards in English and Spanish plus annual cumulative volume

4. Commerce, Business, Markets

Predicasts, Inc.
11001 Cedar Avenue
Cleveland, OH 44106 USA

Method: maintains one of the most comprehensive business information banks in the world; information input from primary and secondary sources; information quantity reduced and quality upgraded via processes ranging from simple data manipulation to sophisticated decision-oriented research; basic operations include cataloging, indexing, abstracting, sorting, storing, and retrieving; analytic operations include composite forecasting, econometrics, market segmentation, input-output analysis, and technoeconomic studies

Products: digest PROMPT; newsletters Predi-Briefs, Marketing Ideas, Financial Ideas, Technical Survey; indexes (for example, F&S Index of Corporate Change); statistical publications (for example, Worldcasts); industry studies (for example, "World Rubber & Tire Markets", "World Health Spending Outlook", "Solar & Conventional Home Heating & Cooling Systems", "Mining Equipment", "World Petrochemicals", "World Food to 1995"); market reports; annotated catalogs (for example, Catalog of Industry Studies)

5. Environment

(1) Biodeterioration Centre

(University of Aston in Birmingham)
St. Peter's College
College Road, Saltley
Birmingham B8 3TE England

Method: produces publications and offers services designed to cover biodeterioration and biodegradation; operates as a self-financing unit, deriving income from sale of publications and services; employs about 12 personnel, including academic, technical, and clerical staff plus postgraduate research students (Centre head and one clerical assistant financed by the University); staff play a part in undergraduate and postgraduate courses in the University and supervise research students working for higher degrees; arranges short courses on a variety of topics for industry; offers industry and commerce a range of services for both short and long term research projects; produces special bibliographies from Centre's document collection; provides photocopies of papers included in bibliographic journals and special bibliographies for a fee; invites enquiries on biodeterioration and biodegradation and supplies answers in the form of relevant documents; allows visitors to the Centre to make appointments to search the literature collection and photocopy desired information (staff available to assist with searches); provides on a contract basis a wide range of facilities for testing materials which may be subject to deterioration and for monitoring the effects of biodeterioration; carries out both short and long term research projects sponsored by industry, government, etc.

Products: three journals (available as hard copy or microfiche): 1) International Biodeterioration Bulletin (includes review articles, research papers, notes on new techniques, book reviews, and the Biodeterioration Society Newsletter) 2) Biodeterioration Research Titles (references to published literature on biodeterioration divided into over 60 sections on materials and organisms for easy reference) 3) Waste Materials Biodegradation Research Titles (classified bibliography of current published literature on all aspects of biological treatment of solid and liquid wastes and the biodegradation of waste materials in nature); special bibliographies (for example, "Fouling of Pipelines and Waste Systems" and "Composting of Agricultural and Municipal Wastes"); occasional publications including A Thesaurus of Terms Used in Biodeterioration and A Catalogue of Potentially Biodeteriogenic Fungi (published jointly with the International Biodegradation Research Group); technical enquiry service; commissioned bibliographies and special studies including literature evaluation; contract research services (two examples are 1. recommendations for preventative measures and 2. short courses on industrial microbiological techniques designed for non-biologists and particular industrial situations and oriented towards both the practical work and the underlying theoretical considerations); research in such general areas as biodeterioration of fuels and biological treatment and upgrading of agricultural wastes

(2) Energy and Environmen[illegible] Information Center
525 Market Street, Mezzanine
San Francisco, CA 94105 USA

(3) Energy/Environment Information Center
Denver Public Library
1357 Broadway
Denver, CO 80203 USA

Method: provides referral service and computerized access to published and unpublished technical reports, articles monographs, theses, and dissertations

Products: technical reports in photocopy or microfiche; fish and wildlife thesaurus; indexes of state research; Fish and Wildlife Reference Service Newsletter; referenced answers to questions such as "How do energy costs affect the rise in inflation?"

6. Health

(1) Appropriate Health Resources and Technologies Action Group
85 Marylebone High Street
London W1M 3DE England

Method: serves as an information center and clearinghouse for materials related to primary health care and health-related technologies; shares in overseas projects, helps to identify unmet needs and possible answers to such needs; links individuals and institutions interested in exchange of ideas at the neighborhood or village level

Products: information sheets; bibliographies; newsletter Diarrhea

Dialogue which focuses on promoting exchange of practical information and experience related to prevention and treatment of diarrhea plus information on the latest developments, ideas, problem solutions, the organization and results of field studies, and the establishment of new national and local programs in diarrheal diseases control in developing countries

(2) International Audiovisual Resource Service
c/o International Planned Parenthood Federation
Dorland House
18-20 Lower Regent Street
London SW1Y 4PW England

Method: identifies and meets demands for audiovisual materials in population control and related areas with emphasis on developing countries; maintains a central AV reference collection of materials including prototypes for adaptation; provides advice, consultation, assistance, and training in material and equipment selection, acquisition, production, and operation; produces technical publications; reproduces, translates, and adapts AV materials; provides an international purchase and distribution service

Products: AV reference collection, multilingual training media, catalogs, and technical publications

7. Centers or Agencies with Information Repackaging Projects in Planning

(1) Documentation Centre

Tata Energy Research Institute
24, Homi Mody Street
Bombay 400 023 India
Subject: renewable energy technology (solar, wind, biogas, etc.)

(2) International Rice Research Institute
Los Banos, Philippines
Subject: rice research, cultivation, etc.

(3) Ministry of National Education
P.O. Box 9121
Dar es Salaam, Tanzania
Subject: adult literacy and education

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